VOLUME 12 NUMBER 14 / JULY 23, 1974

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-22624 Florida Univ., Gainesville.
AN ANALYSIS OF METHODS FOR EXTRACTING AERODYNAMIC COEFFICIENTS FROM TEST DATA Ph.D. Thesis
Donald Clifton Daniel 1973 176 p
Avail: Univ. Microfilms Order No. 74-9592

An analysis of numerical methods for extracting aerodynamic coefficients from dynamic test data has been conducted. The emphasis of the analysis is on the effects that random measurement errors in the data and random disturbances in the system have on the accuracy with which the coefficients for linear and nonlinear systems can be determined. Both deterministic and stochastic methods for extracting the coefficients and determining their uncertainties are considered. Dissert. Abstr.

N74-22625*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRFOIL WAKE VORTEX CHARACTERISTICS IN THE FAR FIELD
K. L. Orloff, D. L. Ciffone, and D. Lorincz Nov. 1973 20 p refs
(NASA-TM-X-62318; A-5262) Avail: NTIS HC $4.00 CSCL 01A

Tangential and axial velocity profiles were measured in the far field wake vortices of several different airfoils. The results are summarized and discussed. A scanning laser velocimeter was used to obtain data up to 1000 chord lengths behind airfoils with rectangular, diamond-shaped, and swept wing planforms at several different angles of attack. The results show general agreement with wind tunnel measurements made in the near field. The results identify two separate flow regions for the dependence of vortex maximum tangential velocity on downstream distance; an inviscid region where the velocity remains constant after rollup to downstream distances of 200 chord lengths, and then a decay or viscous region that persisted to the limit of the test distance. The decay rates appear to be sensitive to both angle of attack and span loading. The maximum tangential velocity for downstream distances to 40 span lengths was reduced by a factor of 2 by changing from an elliptic (swept wing) or rectangular span loading to a triangular-like span loading (diamond-shaped planform wing). Measured axial velocity defects are shown to agree with those predicted by laminar theory. Author

N74-22626*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF SCREEN-INDUCED TOTAL-PRESSURE DISTORTION ON AXIAL-FLOW COMPRESSOR STABILITY
James E. Calogeras, Roy L. Johnsen, and Paul L. Burstadt Washington May 1974 79 p refs
(NASA-TM-X-3017; E-7792) Avail: NTIS HC $4.00 CSCL 12D

An experimental investigation was made to determine the effects of screen-induced total-pressure distortions on two J85-GE-13 turbojet engines. Results were compared to those from a previous program run with a third engine. All compressors were found to be sensitive to a critical angle of circumferential distortion equal to 60 deg., and they all adhered closely to the parallel compressor model. The sensitivity of compressor exit pressure to virtually any type of distortion pattern can be determined by defining stall lines for undistorted, hub radial distorted, and tip radial distorted inflows. The effect of multiple sectors of circumferential distortion is defined. Author

N74-22627*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORWARD SLANTED SLOT THROAT STABILITY BYPASS TO INCREASE THE STABLE AIRFLOW RANGE OF A MACH 2.5 INLET WITH 60 PERCENT INTERNAL CONTRACTION
Robert J. Shaw, Glenn A. Mitchell, and Bobby W. Sanders Washington May 1974 50 p. refs
(NASA-TM-X-2973; E-7706) Avail: NTIS HC $3.25 CSCL 12D

The results of an experimental investigation to increase the stable airflow operating range of a supersonic mixed-compression inlet are presented. Two forward-slanted slot stability-bypass entrance configurations were tested. In terms of diffuser-exit corrected airflow, a large inlet stable airflow range of 18.5 percent was obtained with the superior configuration if a constant pressure was maintained in the bypass plenum. Limited unstart angle-of-attack data are presented. Author

N74-22628# Calspan Corp., Buffalo, N.Y.
TWO-DIMENSIONAL SUBSONIC EXPERIMENTS WITH A NACA 0012 AIRFOIL
R. J. Vidal, P. A. Catlin, and D. W. Chudyk Dec. 1973 54 p refs Sponsored in part by AFOSR
(Contract N00014-72-C-0102; NR Proj. 061-199)
(AD-775880; CALSPAN-RK-5070-A-3) Avail: NTIS CSCL 20/4

Two-dimensional tests were made with a 6-inch chord NACA 0012 section in the Calspan 8-foot Transonic Wind Tunnel to obtain section data with minimum wall interference effects. The measurements included three-component force data, surface pressure distributions and oil flow observations, and were made at Mach numbers ranging from 0.4 to 0.95 and at a chord Reynolds number of 1,000,000. Comparisons of the lift curve data with available theory indicate that the results are within about 1% of being two-dimensional. (Modified author abstract) GRA

N74-22629# ARO, Inc., Arnold Air Force Station, Tenn.
FLOW-FIELD CHARACTERISTICS AND AERODYNAMIC LOADS ON EXTERNAL STORES NEAR THE FUSELAGE AND WING-PYLON POSITIONS OF A SWEPT-WING/FUSELAGE MODEL AT MACH NUMBERS OF 0.4 AND 0.7-PHASE 5 Final Report, 13 Jul. 1972 - 10 Feb. 1973
R. H. Roberts and J. R. Myers AEDC Mar. 1974 144 p

refs
(AF Proj. 8219)
(AD-776291; AEDC-TR-73-87; ARO-PWT-TR-73-43) Avail: NTIS CSCL 01/1

Experimental data were obtained to aid in the prediction of aerodynamic loads and separation-trajectory characteristics on stores under the influence of an aircraft flow field. Four types of data were obtained in the vicinity of a generalized aircraft model: (1) flow field surveys, using a 40 deg cone probe, to determine the local velocity field, (2) force and moment data on four store models, (3) pressure distribution data on an ogive-cylinder model, and (4) captive-trajectory store separation data on one store model. The generalized aircraft model consisted of a swept-wing/fuselage combination with rectangular, flow-through engine ducts. (Modified author abstract) GRA

N74-22630# Naval Ordnance Lab., White Oak, Md.
PREDICTION OF NORMAL FORCE, PITCHING MOMENT, AND YAWING FORCE ON BODIES OF REVOLUTION AT ANGLES OF ATTACK UP TO 50 DEGREES USING A CONCENTRATED VORTEX FLOW-FIELD MODEL
Andrew B. Wardlaw, Jr. 24 Oct. 1973 83 p refs
(AD-775894; NOLTR-73-209) Avail: NTIS CSCL 20/4

A method initially proposed by Bryson is extended to include asymmetric shedding. This method employs the impulsive flow analogy, and models each wake vortex using a single-point vortex. Free parameters inherent in the problem formulation are determined empirically. Normal force, pitching moment and yawing force coefficients are predicted for slender bodies with a nose fineness ratio greater than four and at a Mach number less than 0.9. (Modified author abstract) GRA

N74-22929 European Space Research Organization, Paris (France).
FAIRINGS AT WING FUSELAGE JUNCTIONS
Robert G. Legendre *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 1-10 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 1-4 (For availability see N74-22928 14-12)

N74-22931 European Space Research Organization, Paris (France).
STARTING CONDITIONS FOR SUPERSONIC BLADE CASCADES
Gilbert Janssens, Jean Pierre Guyot et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 35-49 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 17-23 (For availability see N74-22928 14-12)

N74-22932 European Space Research Organization, Paris (France).
CONTROLLING THE MACH NUMBER DISTRIBUTION BEHIND A SUBSONIC ANNULAR BLADE CASCADE BY MEANS OF THE PRESSURE DROP
Jacques Paulon *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 50-60 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 25-29 (For availability see N74-22928 14-12)

N74-22933 European Space Research Organization, Paris (France).
TWO-DIMENSIONAL SUBSONIC LINEARIZED FLOW THEORY OF THE UNSTEADY FLOW THROUGH A BLADE CASCADE HAVING SMALL CAMBER AND AT LOW INCIDENCE
Jacques Leclerc *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 61-76 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 31-39 (For availability see N74-22928 14-12)

N74-22934 European Space Research Organization, Paris (France).
CALCULATION OF THE UNSTEADY SUBSONIC AERODYNAMIC PRESSURES ON COMPRESSOR BLADES
P. Salaun *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 77-90 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan-Feb. 1973 p 41-49 (For availability see N74-22928 14-12)

N74-23513 European Space Research Organization, Paris (France).
CALCULATION OF FLOWS AROUND WINGS WITHOUT THICKNESS WITH EVOLUTIVE VORTEX SHEETS
Colmar Rehbauch (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 1-15 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 53-61 (For availability see N74-23512 14-34)

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-22631*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXTERNALLY BLOWN FLAP NOISE RESEARCH
Robert G. Dorsch 1974 44 p refs Presented at the Natl. Air Transportation Meeting, Dallas, 30 Apr. - 2 May 1974; sponsored by SAE
(NASA-TM-X-71541; E-7948) Avail: NTIS HC $5.25 CSCL 01C

The Lewis Research Center cold-flow model externally blown flap (EBF) noise research test program is summarized. Both engine under-the-wing and over-the-wing EBF wing section configurations were studied. Ten large scale and nineteen small scale EBF models were tested. A limited number of forward airspeed effect and flap noise suppression tests were also run. The key results and conclusions drawn from the flap noise tests are summarized and discussed. Author

N74-22632# Comptroller General of the United States, Washington, D.C.
PROBLEMS IN MANAGING THE DEVELOPMENT OF AIRCRAFT ENGINES, DEPARTMENT OF DEFENSE
[1973] 37 p refs
(B-179166) Avail: NTIS MF $1.45; US General Accounting Office, Room 4522, 441 G Street, N. W., Washington, D. C. 20548 HC $1.00

A study was made of the contractural and procurement procedures followed by the Department of Defense in obtaining aircraft engines. The management of the development and modification activities is analyzed. Deficiencies in the present system are reported and recomendations are made for an improved procedure. Author

N74-22633*# Bell Helicopter Co., Fort Worth, Tex.
INVESTIGATION OF THE EFFECT OF HUB SUPPORT PARAMETERS ON TWO-BLADED ROTOR OSCILLATORY LOADS
Charles D. Lee and James A. White May 1974 82 p refs
(Contract NAS1-11352)
(NASA-CR-132435) Avail: NTIS HC $7.25 CSCL 01C

The results are presented of a test program and analysis to investigate the effects of inplane hub support parameters on the oscillatory chordwise loads of a two-bladed teetering rotor. The test program was conducted in two phases. The first consisted of a shake test to define the impedance of a number of test configurations as a function of frequency. The second phase was the test of these configurations in the NASA-Langley transonic dynamics tunnel. The test showed that the one-per-rev inplane bending moments could be changed by a factor of 2.0 as a function of the pylon configuration at the same aerodynamic operating condition. The higher harmonic inplane, flapwise, and torsional bending moments, and pitch link axial loads were not affected by changes in inplane hub impedance. The maximum inplane loads occurred for the pylon configuration with the minimum spring rate and maximum inertia. Author

N74-22634# Advisory Group for Aerospace Research and Development, Paris (France).

ABBREVIATED TEST LANGUAGE FOR AVIONICS SYSTEMS

D. A. Green Sep. 1972 61 p refs
(AGARD-LS-54) Avail: NTIS HC $6.25

The basic concepts of ATLAS and a selection of some of the more common verbs for constructing test procedures are presented. The overall organization is described of an ATLAS program i.e. the division into preamble and procedural sections. Following this the general structure of an ATLAS statement is discussed to illustrate the general layout of a statement and its internal fields. The fields discussed are as follows, the fixed field which involves the flag, statement number and verb, and the variable field which includes the measured characteristic, noun, statement characteristic, and the evaluation and connection fields. It is shown that the organization of the variable field is determined by the verb used in the fixed field. Author

N74-22635# National Transportation Safety Board, Washington, D.C. Bureau of Aviation Safety.

AIRCRAFT ACCIDENT REPORT: TEXAS INTERNATIONAL AIRLINES, INC., CV-600, N94230, MENA, ARKANSAS, SEPTEMBER 27, 1973

11 Apr. 1974 37 p
(NTSB-AAR-74-4) Avail: NTIS HC $5.00

At 2052, September 27, 1973, a Texas International Airlines, Inc., CV-600, N94230, crashed in the Ouachita Mountain Range, Arkansas. The National Transportation Safety Board determines that the probable cause of the accident was the captain's attempt to operate the flight under visual flight rules in night instrument meteorological conditions, without using all the navigational aids and information available to him; and his deviation from the preplanned route, without adequate position information. The carrier did not monitor and control adequately the actions of the flightcrew or the progress of the flight. Author

N74-22636*# Kanner (Leo) Associates, Redwood City, Calif.

REMOTELY PILOTED VEHICLES: NECESSITY, WISHFUL THINKING OR PLAYTHING

R. Olsen Washington NASA May 1974 34 p Transl. into ENGLISH from the German report "Flug Revue/Flugwelt International" Dec. 1973 p 27-30, 35-38
(Contract NASw-2481)
(NASA-TT-F-15580) Avail: NTIS HC $4.75 CSCL 01C

A survey is made of the various classes of unmanned flying craft and their applications, and their history is outlined, covering balloons, drones, early missiles, guided missiles, the German space program prior to and during WW II, and VTOL equipment. The most important military uses for RPVs are concluded to be reconnaissance and transport, the latter also possessing spinoff value for the civilian sector. Fighter RPVs are found to be ineffectual, whereas the one-way delivery of weapons has proven quite feasible. Author

N74-22637*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A FLIGHT INVESTIGATION OF THE STOL CHARACTERISTICS OF AN AUGMENTED JET FLAP STOL RESEARCH AIRCRAFT

Hervey C. Quigley, Robert C. Innis, and Seth Grossmith (Min. of Transport, Canada) May 1974 143 p refs
(NASA-TM-X-62334; A-5418) Avail: NTIS HC $10.25 CSCL 01C

The flight test program objectives are: (1) To determine the in-flight aerodynamic, performance, and handling qualities of a jet STOL aircraft incorporating the augmented jet flap concept; (2) to compare the results obtained in flight with characteristics predicted from wind tunnel and simulator test results; (3) to contribute to the development of criteria for design and operation of jet STOL transport aircraft; and (4) to provide a jet STOL transport aircraft for STOL systems research and development. Results obtained during the first 8 months of proof-of-concept flight testing of the aircraft in STOL configurations are reported. Included are a brief description of the aircraft, fan-jet engines, and systems; a discussion of the aerodynamic, stability and control, and STOL performance; and pilot opinion of the handling qualities and operational characteristics. Author

N74-22638*# Alabama Univ., Huntsville. Div. of Graduate Programs and Research.

INVESTIGATION OF THE JET NOISE PREDICTION THEORY AND APPLICATION UTILIZING THE PAO FORMULATION Final Technical Report

Nov. 1973 159 p refs
(Contract NAS8-28588)
Avail: NTIS HC $11.00 CSCL 20A

Application of the Phillips theory to engineering calculations of rocket and high speed jet noise radiation is reported. Presented are a detailed derivation of the theory, the composition of the numerical scheme, and discussions of the practical problems arising in the application of the present noise prediction method. The present method still contains some empirical elements, yet it provides a unified approach in the prediction of sound power, spectrum, and directivity. Author

N74-22639*# Boeing Commercial Airplane Co., Seattle, Wash.

DEVELOPMENT OF ACOUSTICALLY LINED EJECTOR TECHNOLOGY FOR MULTITUBE JET NOISE SUPPRESSOR NOZZLES BY MODEL AND ENGINE TESTS OVER A WIDE RANGE OF JET PRESSURE RATIOS AND TEMPERATURES Final Report

J. Atvars, G. C. Paynter, D. Q. Walker, and C. F. Wintermeyer Washington NASA Apr. 1974 336 p refs
(Contract NAS3-15570)
(NASA-CR-2382; D6-60226) Avail: NTIS HC $7.50 CSCL 21E

An experimental program comprising model nozzle and full-scale engine tests was undertaken to acquire parametric data for acoustically lined ejectors applied to primary jet noise suppression. Ejector lining design technology and acoustical scaling of lined ejector configurations were the major objectives. Ground static tests were run with a J-75 turbojet engine fitted with a 37-tube, area ratio 3.3 suppressor nozzle and two lengths of ejector shroud (L/D = 1 and 2). Seven ejector lining configurations were tested over the engine pressure ratio range of 1.40 to 2.40 with corresponding jet velocities between 305 and 610 M/sec. One-fourth scale model nozzles were tested over a pressure ratio range of 1.40 to 4.0 with jet total temperatures between ambient and 1088 K. Scaling of multielement nozzle ejector configurations was also studied using a single element of the nozzle array with identical ejector lengths and lining materials. Acoustic far field and near field data together with nozzle thrust performance and jet aerodynamic flow profiles are presented. Author

N74-22640# Advisory Group for Aerospace Research and Development, Paris (France).

NOISE MECHANISMS

Mar. 1974 345 p refs Mostly in ENGLISH; partly in FRENCH Presented at Fluid Dyn. Panel Specialists Meeting, Brussels, Belgium, 19-21 Sep. 1973
(AGARD-CP-131) Avail: NTIS HC $20.25

Emphasis of the conference was on the fundamental problems of noise generation and attenuation. Main aspects considered were noise generation and damping, combustion and jet noise, sonic boom theory, and noise due to boundary and shear layer effects. For individual titles, see N74-22641 through N74-22670.

N74-22641 Cambridge Univ. (England). Engineering Lab.

[THE MECHANICS OF SOUND GENERATED BY TURBULENT FLOWS]

J. E. Efowcs Williams *In* AGARD Noise Mech. Mar. 1974 15 p (For availability see N74-22640 14-02)

Emphasis of the conference was on aeronautical problems arising from the field of aircraft noise control. Presentations are grouped under six separate headings: (1) source identification; (2) influence of mean flow structure on the generation and propagation of sound; (3) distinctive large eddy structures; (4)

excess noise; (5) control of jet noise; and (6) problem areas likely to become more important. The main technical points arising from the meeting are outlined and the degree to which they appear to be currently understood is assessed. Several technical areas on which there was no clear concensus are covered in some detail and some speculation is made on the way they might develop. Author

N74-22642 Cambridge Univ. (England). Dept. of Engineering.
IMPULSIVE SOURCES OF AERODYNAMIC SOUND
John E. Efowcs Williams *In* AGARD Noise Mech. Mar. 1974 6 p refs (For availability see N74-22640 14-02)

The rapid acceleration of large bodies causes the local motion to shed its kinetic energy into the radiation field. A body steadily moving in potential flow sheds all its virtual energy into sound if it is brought to rest impulsively. Such rapidly accelerated large scale motions therefore represent an extremely efficient source of aerodynamic sound. Motions of this type are discussed with a view to explaining the origin of occasional particularly violent pressure transients that are observed in the noise field of high velocity jets. Author

N74-22643 Cambridge Univ. (England). Engineering Lab.
IMPULSIVE SOURCES OF AERODYNAMIC SOUND: ORAL SCRIPT OF THE INTRODUCTORY REVIEW LECTURE
John E. Efowcs Williams *In* AGARD Noise Mech. Mar. 1974 24 p (For availability see N74-22640 14-02)

The sources of aircraft noise due to rapid acceleration of large bodies is discussed. Work by Lighthill and other investigators is reviewed and a discussion is given to explain the origin of occassional violent pressure transients observed in the noise field of high velocity jets. A.L.

N74-22644* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTAL EVALUATION OF FLUCTUATING DENSITY AND RADIATED NOISE FROM A HIGH-TEMPERATURE JET
P. F. Massier, S. P. Parthasarathy, and R. F. Cuffel *In* AGARD Noise Mech. Mar. 1974 19 p refs (For availability see N74-22640 14-02)
(Contract NAS7-100)

An experimental investigation has been conducted to characterize the fluctuating density within a high temperature (1100 K) subsonic jet and to characterize the noise radiated to the surroundings. Cross correlations obtained by introducing time delay to the signals detected from spatially separated crossed laser beams set up as a schlieren system were used to determine radial and axial distributions of the convection velocity of the moving noise sources (eddies). In addition, the autocorrelation of the fluctuating density was evaluated in the moving frame of reference of the eddies. Also, the autocorrelation of the radiated noise in the moving reference frame was evaluated from cross correlations by introducing time delay to the signals detected by spatially separated pairs of microphones. The radiated noise results are compared with Lighthill's theory and with the data of Lush. Radial distributions of the mean velocity were obtained from measurements of the stagnation temperature, and stagnation and static pressures with the use of probes. Author

N74-22645* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DIRECT MEASUREMENT OF SOUND SOURCES IN AIR JETS USING THE CROSSED BEAM CORRELATION TECHNIQUE
R. J. Damkevala, F. R. Grosche (DFVLR-AVA Goettingen, W. Germany), and S. H. Guest *In* AGARD Noise Mech. Mar. 1974 16 p refs (For availability see N74-22640 14-02)
(Contract NAS8-27011)

Properties of density fluctuations were measured in the turbulent regions of a 2.54 cm air jet, at M = 0.7, 1.0 and 1.94. After calibration tests, it was found that the absorption of infrared radiation at 4.3 microns by the naturally present quantities of carbon-dioxide in air was directly proportional to the air density if a sufficiently wide bandpass (0.08 microns) was used. Moreover, regions of the band could be selected that adequately discriminated against temperature variations. The cross-correlation of two such beams intersecting in the jet gave a measure of the local properties at the intersection point. A derivation is presented relating the local density correlation function to the self and shear generated noise in the far field of the jet. The measured correlations are used to predict the axial distribution of source strengths and the spectrum of noise due to a unit volume of turbulence. Author

N74-22646 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Goettingen (West Germany).
DISTRIBUTIONS OF SOUND SOURCE INTENSITIES IN SUBSONIC AND SUPERSONIC JETS
F. R. Grosche *In* AGARD Noise Mech. Mar. 1974 10 p refs (For availability see N74-22640 14-02)

Clues on the validity of aerodynamic noise theories can be provided by comparison of predicted distributions of sound source intensities in turbulent jets with source distributions determined directly by suitable acoustic measurements. A method of tracing the sound sources from the sound radiated into the acoustic far field was developed. The sound waves emitted by a small volume of the jet are focused upon a microphone well outside the flow by means of a large elliptical mirror. The distribution of sound source intensities is investigated by moving the mirror-microphone assembly along and normal to the jet axis. Results of measurements with subsonic and supersonic jets show interesting details of the noise generation within these jets. Author

N74-22647 Lyon Univ. (France).
CORRELATIONS BETWEEN FAR FIELD ACOUSTIC PRESSURE AND FLOW CHARACTERISTICS FOR A SINGLE AIRFOIL
M. Sunyach, H. Arbey, D. Robert, J. Bataille, and G. Comte-Bellot *In* AGARD Noise Mech. Mar. 1974 12 p refs (For availability see N74-22640 14-02)

A NACA 6512 A sub 10 airfoil, whose chord is 8 cm, was placed in a uniform flow and ducted into an anechoic chamber with a speed ranging from 20 to 40 m/s. Its acoustic far field was analyzed in relation with the normal velocity fluctuations in the wake and the pressure fluctuations on the airfoil surface. Cross-correlations measurements showed that the aerodynamic pattern close to the trailing edge, on the extrados, controls the noise emission. Author

N74-22648 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
REPRESENTATION OF HOT JET TURBULENCE BY MEANS OF ITS INFRARED EMISSION c23
Jean Francois DeBelleval and Mariano Perulli *In* AGARD Noise Mech. Mar. 1974 10 p refs In FRENCH; ENGLISH summary (For availability see N74-22640 14-02)

The theoretical description of a jet acoustic radiation is usually described by characteristic turbulence data, defined at the scale of the total emissive volume. These data are deduced from theoretical models or from measurements making use of correlation techniques. These data have average values in time representing the whole spectrum. After a discussion on the nature of acoustic sources which may exist in a hot jet, and after recalling the crossed beam techniques, a representation of a hot jet turbulence by means of crossed spectral densities is presented. It is then possible to define at any point of the source volume the characteristic turbulence data by frequency bands, and thus to know their dispersion. Author

N74-22649 British Columbia Univ., Vancouver. Dept. of Mechanical Engineering.
NOISE SOURCE DIAGNOSTICS USING CAUSALITY CORRELATIONS
Thomas E. Siddon *In* AGARD Noise Mech., Mar. 1974 13 p refs (For availability see N74-22640 14-02)
(Grants NRC A7106; DRB-G-9611-03)

Due to the complex mix of noise mechanisms for current quieter generations of aircraft, it has become more difficult to detect the small changes in overall decibel level which may result from localized design modifications. An increasingly popular diagnostic technique establishes causative relationships between individual noise source phenomena and the overall (composite) sound radiation. The method uses real-time cross-correlations between the far field sound pressure and fluctuating physical parameters occurring in, on, and around the noise generating machine. The technique is based on established aeroacoustic theory and has been shown to yield information on acoustic source distributions, their local spectra, and scales of coherence. The basic causality formalisms are reviewed and their use illustrated by reference to a number of proven experimental applications. It is shown that by judicious choice of control surfaces the methods can be adapted in unique ways to the elucidation of a number of unresolved noise generation and suppression phenomena. Examples pertaining to jets, suppressor nozzles, rotating fan blades, and flow interaction with leading and trailing edges are included. Author

N74-22650* California Univ., Los Angeles. School of Engineering and Applied Science.

USE OF CROSS-CORRELATION MEASUREMENTS TO INVESTIGATE NOISE GENERATING REGIONS OF A REAL JET ENGINE AND A MODEL JET

W. C. Meecham and P. M. Hurdle *In* AGARD Noise Mech. Mar. 1974 13 p refs Sponsored by NASA (For availability see N74-22640 14-02)
CSCL 20A

Cross-correlations are reported of the jet static pressure fluctuations (as measured with a B and K microphone fitted with a nose cone), with the far-field radiated sound pressure. These measurements were made for various probe positions and a large number of far-field positions (at various angles). In addition, the tests were run for a number of different jet exit velocities. The measured, normalized cross-correlation functions vary between 0.004 and 0.155. These values depend upon the angular position of the far-field microphone, the jet exit Mach number, and the position of the probe. In addition, the cross-correlation technique was employed to study the symmetry of the far-field radiated sound about the jet axis. Third-octave analyses of both the probe signal and the far-field radiated sound were made. This is the first time correlation measurements have been made on a jet engine. In addition, a report is given on an extensive noise survey of a model jet. The correlations are related to sound source functions and jet source regions are discussed. Author

N74-22651 Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.

SOME EXPERIMENTAL OBSERVATIONS OF THE REFRACTION OF SOUND BY ROTATING FLOW c23

G. D. Butler, T. A. Holbeche, and P. Fethney *In* AGARD Noise Mech. Mar. 1974 10 p refs (For availability see N74-22640 14-02)

Some experimental and theoretical studies of the interaction of sound with a rotating flow field in the form of an aerodynamic vortex are described. The experiments were carried out in the acoustically-treated working-section of the RAE 24-foot diameter open-jet wind tunnel. Vortices were generated by setting a sharp-edged wing at incidence in the tunnel airstream and the effect of the vortex flow downstream of the wing trailing-edge on the noise propagating from a small loudspeaker source was investigated over a range of frequencies and wind speeds. Considerable refractive redistribution of the sound energy by the vortex flow occurred, leading to far field regions of markedly decreased and increased sound intensity. Qualitatively, these effects are consistent with the predictions of ray theory, although the interaction persisted down to frequencies where ray theory might be regarded as inapplicable. Some possible reasons for the observed differences with theory are briefly discussed. Author

N74-22652 General Electric Co., Schenectady, N.Y. Mechanical Engineering Lab.

THE ISSUE OF CONVECTIVE AMPLIFICATION IN JET NOISE c23

Ramani Mani *In* AGARD Noise Mech. Mar. 1974 12 p refs Sponsored in part by Air Force (For availability see N74-22640 14-02)

Three problems of the sound power and power spectrum produced by moving acoustic sources shrouded by jet flows were considered. The jets were assumed (for simplicity) to be characterized by a slug flow or top hat type mean velocity profiles. The sources were simple harmonic in their own frame of reference and were assumed to convect with the same velocity as the jet. The first problem considered the case of a monopole source convecting along the axis of a round jet. The second problem considered the case of convected line sources in a plane or two-dimensional jet. This was motivated by the need to understand the effect of off-axis lines of convection. The last problem was a variation of the first wherein the jet density and temperature are allowed to differ from those of the ambient. It was motivated by the need to understand the noise from heated jets. The studies were all motivated by one notion, namely, that Lighthill's original idea of ascribing jet noise to convected sources radiating freely to the ambient needs revision to allow for mean flow shrouding effects. The studies explain several experimentally observed features of jet noise such as a failure to exhibit convective amplification (particularly at high frequencies and shallow angles to the exhaust axis) and associated failure to peak frequencies in the power spectrum to shift linearly with jet velocity. Implifications for the jet density exponent issue for heated jets were also considered. The study may be regarded as moving sources solutions to the Phillips equation for jet noise with a specific velocity profile, namely the top hat profile. The advantage of choice of a simple velocity profile is to obtain solution valid for arbitrary frequencies. Author

N74-22653 Southampton Univ. (England). Inst. of Sound and Vibration Research.

THE NOISE FROM SHOCK WAVES IN SUPERSONIC JETS

M. Harper-Bourne and M. J. Fisher *In* AGARD Noise Mech. Mar. 1974 13 p refs (For availability see N74-22640 14-02)

A theoretical model is proposed for the prediction of the characteristics of broadband shock associated noise from jets operated above the critical pressure ratio. The model regards each shock cell end as a source of acoustic radiation with relative phasing set by the time of eddy convection between them. This leads to a prediction for the peak frequency of this noise component as a function of both pressure ratio and angle of observation which is amply confirmed by experimental results. The model is also extended to the prediction of the spectrum of shock associated noise and these predictions are also compared with experimental data. It is also shown that the intensity of shock noise is a function only of pressure ratio, and is independent of jet stagnation temperature and hence jet efflux velocity. Author

N74-22654 Southampton Univ. (England). Inst. of Sound and Vibration Research.

NOISE FROM HOT JETS

P. A. Lush and M. J. Fisher *In* AGARD Noise Mech. Mar. 1974 8 p refs (For availability see N74-22640 14-02)

Measurements of the noise from several independent workers of hot subsonic jets show that the noise decreases relative to the unheated jet at high jet velocity but increases at low velocity. The decrease at high velocity has previously been explained by the reduction in the jet density for the hot jet and this explanation is confirmed by the present study. The increase in noise at low velocity is attributed to an additional source caused by entropy fluctuations which varies as U4 compared with U8 for the usual mixing noise. A simple theoretical model using Lighthill's theory of aerodynamic sound is proposed and this gives very good agreement with the experimental results, but the theoretical model cannot be justified rigorously. However it could provide a satisfactory method for prediction of the noise from hot jets and a basis for the collapse of data. Author

N74-22655 Southampton Univ. (England). Dept. of Aeronautics and Astronautics.

ON THE NOISE FROM JETS

G. M. Lilley *In* AGARD Noise Mech. Mar. 1974 12 p refs (For availability see N74-22640 14-02)

A modification of Lighthill's theory is discussed in which pressure disturbances in the jet are treated as an inner flow problem which is matched to the outer flow radiation problem. In this treatment the source function involves quadratic and higher order small disturbance terms. This approach, although more complicated mathematically than the exact theory of Lighthill, has the advantage that it draws attention directly to the role played by the mean velocity and temperature distributions on the generation and propagation of the emitted sound. The model in its simplest form can be reduced to a vortex sheet model and thus draws attention to the stability characteristics of the vortex sheet. In the more general treatment the stability characteristics of the mixing region are considered and its least stable modes are regarded as dominating the large-scale eddy motion. The linear stability theory is extended to deal with non linearities and, as a result, the amplitude of the larger-scale motion is determined. This is compared with the measured large-scale structure of the jet. From this model the main characteristics of the source function are found. The paper concludes with some results from this new formulation and a comparison is made with experimental findings. Author

N74-22656 Imperial Coll. of Science and Technology, London (England). Dept. of Mathematics.
MECHANISMS OF EXCESS JET NOISE
D. G. Crighton *In* AGARD Noise Mech. Mar. 1974 7 p refs (For availability see N74-22640 14-02)

Excess noise is a term used to describe the deviations of measured noise fields from the predictions of Lighthill's theory of pure jet mixing noise. A definition is given for the current state of theoretical understanding of those excess noise fields which are not directly attributable to rotating machinery, or to shock waves in supersonic jets. It is shown that unsteady flow interaction with the jet pipe can generate intense forward arc and sideline noise levels, while abnormally high rear arc levels are suggested to arise from the propagation of genuine sound fields across the exit plane, with associated refraction and diffraction effects. A further process, not yet properly quantified, is related to the instability of a (fully turbulent) jet to certain preferred large scale disturbances, and leads to a mechanism (parametric amplification) by which internal sound fields may be greatly augmented in either the rear or forward arcs. Author

N74-22657 Gottingen Univ. (West Germany). Physikalisches Inst.
EXPERIMENTS CONCERNING THE FLOW DEPENDENT ACOUSTIC PROPERTIES OF PERFORATED PLATES
Juergen Kompenhans and Dirk Ronneberger *In* AGARD Noise Mech. Mar. 1974 6 p refs (For availability see N74-22640 14-02)

The results are presented of investigations of the influence of grazing flow on the impedance of a single orifice serving as a simplified model of a perforated plate. At small flow velocities the impedance curve plotted in the complex plane passes through a spiral. For higher flow velocities the resistive part of the impedance increases linearly with the flow velocity whereas the reactive part decreases. A relation between the impedance and the static flow resistance can be established. Possible nonlinear properties of the orifice are discussed. Author

N74-22658 National Aeronautical Establishment, Ottawa (Ontario).
A DETERMINISTIC MODEL OF SONIC BOOM PROPAGATION THROUGH A TURBULENT ATMOSPHERE
B. H. K. Lee and H. S. Ribner *In* AGARD Noise Mech. Mar. 1974 13 p refs Prepared in cooperation with Toronto Univ., Ontario (For availability see N74-22640 14-02)

The propagation of a weak normal shock wave through a turbulent atmosphere is studied in terms of an idealized model. The turbulent field is assumed to be weak and represented by the superposition of two inclined shear waves of opposite inclination to the mean flow. The resulting flow is of a cellular nature. The cells are rectangular in shape and the sense of rotation of the flow alternates from cell to cell. If the angles made by the normal of the incident shear waves with the direction of the mean flow are greater than some critical value an exponentially decaying pressure wave is generated behind the shock. Spiked or rounded waveforms are obtained by adding or subtracting this pressure wave from the steady state pressure field. An illustrative example for a mean flow Mach number of 1.0005 is considered. This gives a steady state overpressure of 2.45 lb/ft sq across the shock which is typical of the overpressure in a sonic boom. Author

N74-22659 Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
SONIC BOOM BEHAVIOR NEAR A CAUSTIC
Frank Obermeier *In* AGARD Noise Mech. Mar. 1974 14 p refs (For availability see N74-22640 14-02)

The pressure signature is analyzed of an ideal N-shaped sonic boom caused by an accelerated projectile. Its signature in the surroundings of the so-called caustic and behind the caustic is discribed by the equations of linear wave acoustics. The calculations are performed for a special case where the acceleration phase is chosen in such a way that the corresponding Mach-cone, modified by the acceleration, is composed of a truncated cone, the lower part of which has a circle like curved surface and the upper part is ordinary straight cone. The proposed theory yields results which are in good agreement with measurements. Author

N74-22660 Institut Franco-Allemand de Recherches, St. Louis (France).
INFLUENCE OF METEOROLOGICAL CONDITIONS ON THE POSITION OF THE GROUND COVERED BY SONIC BOOMS [INFLUENCE DES CONDITIONS METEOROLOGIQUES SUR LA POSITION AU SOL DU TAPIS DE BANG]
M. Schaffar and C. Thery *In* AGARD Noise Mech. Mar. 1974 12 p refs In FRENCH (For availability see N74-22640 14-02)

Numerical methods and theories used to study sonic boom propagation in the real atmosphere are discussed. Special attention wàs given to the effect of meteorological conditions on lateral and longitudinal extension and the location of the ground focus line. Transl. by E.H.W.

N74-22661 Societe Nationale d'Etude et de Construction de Moteurs d'Aviation, Paris (France).
RECENT STUDIES INTO CONCORDE NOISE REDUCTION
R. Hoch and R. Hawkins (Rolls Royce, Ltd., Bristol, Engl.) *In* AGARD Noise Mech. Mar. 1974 14 p refs Prepared in cooperation with Rolls Royce, Ltd., Bristol, Engl. (For availability see N74-22640 14-02)

Recent research is summarized which was conducted over the past two years as part of a continuing noise reduction program on the Concorde powerplant. The studies were aimed at: (1) improving knowledge of certain noise sources of the Olympus 593 turbojet engine and (2) evaluating potential means for noise reduction either at source by alteration to the various engine components, or by addition of attenuating devices. Some of the results of the studies have been applied to the powerplant design standard intended for entry into service, others are mentioned only for their technical or didactic interest, and others after engineering evaluation, may lead to acoustic improvements to the Concorde powerplant after entry into service. Author

N74-22662 Technische Hogeschool, Eindhoven (Netherlands). Fluid Mechanics Lab.
AEROSONIC GAMES WITH THE AID OF CONTROL ELEMENTS AND EXTERNALLY GENERATED PULSES
L. J. Poldervaart, A. P. J. Wijnands, and L. Bronkhorst *In* AGARD Noise Mech. Mar. 1974 4 p refs (For availability see N74-22640 14-02)

Experiments were conducted which indicate that with the aid of control elements, it is possible to generate the following modes of vibration of a 2-dimensional sonic jet: (1) zero mode; (2) oscillatory mode, natural and forced; (3) pulsatory mode; and (4) coupled pulsatory-oscillatory mode. The experiments also demonstrated that with the aid of externally generated pulses, it is possible to show how the information, near the nozzle tip, is transferred from the pulse into the jet. The nozzle tip as a discontinuity proves to be a dominant factor in the interaction process of the pulse with the boundary layer and with the jet. Author

N74-22663 University of Southern Calif., Los Angeles. Dept. of Aerospace Engineering.
ON THE GENERATION OF JET NOISE
J. Laufer, R. E. Kaplan, and W. T. Chu *In* AGARD Noise Mech. Mar. 1974 8 p refs (For availability see N74-22640 14-02)
(Grant DOT-OS-00002)

It is proposed that the rate of subharmonic production, that is, the rate at which large scale vortex-ring like structures interact with each other, is the primary mechanism responsible for most of the noise generation of a subsonic jet. The interaction consists of simultaneous acceleration and deceleration of vorticity containing coherently moving regions followed by a pairing process. This picture is consistent with Lighthill's quadrupole like sources, as well as with the formulation of Powell's vortex sound theory. It is suggested that more direct experiments are necessary to examine the validity of the above proposition. Author

N74-22664 Naval Ship Research and Development Center, Washington, D.C. Hydroacoustic Branch.

AN EXPERIMENTAL STUDY OF THE INTERMITTENT WALL PRESSURE BURSTS DURING NATURAL TRANSITION OF A LAMINAR BOUNDARY LAYER c12

Fred C. DeMetz and Mario J. Casarella *In* AGARD Noise Mech. Mar. 1974 18 p refs (For availability see N74-22640 14-02)

The properties of the intermittent wall pressure field were measured in the transition boundary layer on a large flat plate in an anechoic wind tunnel. Natural transition was achieved with a mild favorable pressure gradient at Reynolds numbers, based on downstream distance from the plate's leading edge, in excess of 7 million. The development of the laminar boundary layer prior to transition was in agreement with numerical solutions to the laminar boundary layer equations and with stability criteria for pressure gradient effects. The temporal, spatial, and spectral properties of the transition wall pressure field associated with the natural transition process occurring on the plate are obtained as a function of the intermittency factor, and compared with those of the fully turbulent pressure field. Specifically, the mean-square pressure, spectral densities, convection velocities, distributions of burst periods and burst rates of the intermittent pressure field are computed from the data. Author

N74-22665 Technische Hochschule, Aachen (West Germany). Aerodynamisches Inst.

ON THE INTERACTION BETWEEN A SHOCK WAVE AND A VORTEX FIELD

A. Naumann and E. Hermanns *In* AGARD Noise Mech. Mar. 1974 10 p refs (For availability see N74-22640 14-02)

In a double side shock tube, the flow pattern produced by the interaction of a weak shock wave with a vortex field was observed by means of Mach-Zehnder interferograms; the vortex circulation and the pressure ratio of the shock were varied. An evaluation of the interferograms gives the time dependent density fields. The deformation of the interacting shock leads to a discontinuity in slope of its front and to the formation of a secondary wave from the sharp bending point. With the assumption of linear superposition, the flow pattern is in very good agreement between the theoretical and experimental results. Author

N74-22666 Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

INVESTIGATION OF THE INSTANTANEOUS STRUCTURE OF THE WALL PRESSURE UNDER A TURBULENT BOUNDARY LAYER FLOW c12

R. Emmerling, G. E. A. Meier, and A. Dinkelacker *In* AGARD Noise Mech. Mar. 1974 12 p refs (For availability see N74-22640 14-02)

An optical method was used to investigate the instantaneous structure of the wall pressure under a turbulent boundary layer flow in air. The optical apparatus consisted basically of a Michelson-interferometer. One mirror of the interferometer was replaced by a reflecting flexible wall, which was also part of the wall bounding the flow being investigated. The turbulent wall pressure fluctuations cause the flexible wall to be displaced by several light wave-lengths. The instantaneously occurring fringe patterns were recorded with a high-speed film camera. The wall area observed was 48 mm x 29 mm, and the flow velocity outside the boundary layer was 8.5 m/sec. The optical method used made it possible to determine the instantaneous values of the wall pressure distribution, the convection velocity and the wall pressure gradient. Author

N74-22667 Royal Air Force Central Medical Establishment, London (England).

SOME AEROMEDICAL ASPECTS OF NOISE

P. F. King *In* AGARD Noise Mech. Mar. 1974 5 p refs (For availability see N74-22640 14-02)

The different problems and patterns of noise related to various types of aircraft are considered. The types of aircraft include: (1) fixed wing aircraft, (2) V-STOL aircraft, (3) rotating wing aircraft, and (4) air cushion vehicles. In addition, various measures for conservation and protection of hearing are proposed. D.L.G.

N74-22668* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CURRENT STRUCTURAL VIBRATION PROBLEMS ASSOCIATED WITH NOISE c32

John S. Mixson *In* AGARD Noise Mech. Mar. 1974 16 p refs (For availability see N74-22640 14-02)

As the performance of aerospace vehicles has increased, the noise generated by the propulsion system and by the passage of the vehicle through the air has also increased. Further increases in performance are now underway for space vehicles such as the space shuttle vehicle and for short distance takeoff and landing (STOL) aircraft, and are being planned for supersonic aircraft. The flight profiles and design features of these high-performance vehicles are reviewed and an estimate made of selected noise-induced structural vibration problems. Considerations for the prevention of acoustic fatigue, noise transmission, and electronic instrument malfunction are discussed. Author

N74-22669 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.

RESOLUTION OF TURBULENT JET PRESSURE INTO AZIMUTHAL COMPONENTS c12

H. V. Fuchs *In* AGARD Noise Mech. Mar. 1974 10 p refs (For availability see N74-22640 14-02)

The results are presented of experiments conducted to analyze the turbulent pressure field with respect to the jet noise problem. The experiments deal specifically with the turbulent pressure field in a fixed plane normal to the jet axis. The findings indicate that at low Mach numbers, considerable turbulent energy is stored in lower order azimuthal components and, in particular, in the large scale coherent axisymmetric type of fluctuation. D.L.G.

N74-22670 London Univ. (England). Dept. of Aeronautical Engineering.

SOME EXPERIMENTAL RESULTS ON EXCESS NOISE c12

A. D. Young *In* AGARD Noise Mech. Mar. 1974 5 p refs (For availability see N74-22640 14-02)

Compressed air was ducted from a 12 in. diameter pipe into a plenum chamber 24 in. diameter and 4 ft long. This was followed by a contraction leading to a nozzle from which the air emerged into the atmosphere in an anechoic chamber as a jet. The plenum chamber contained a honeycomb and gauze to help reduce the flow turbulence. The resulting jets were very steady and with low turbulence levels. Noise measurements were made at a distance of 6 feet from the nozzle exit. In addition to the measurements on the basic jets, various modifications were introduced upstream of the nozzle exit to produce various intensities and scales of turbulence, and the consequent effects on the noise characteristics were measured. The results are given and their significance is discussed. Author

N74-22671*# Systems Technology, Inc., Hawthorne, Calif.

ANALYSIS AND MOVING BASE SIMULATION OF TRANSITION CONFIGURATION MANAGEMENT ASPECTS OF A POWERED LIFT AIRCRAFT

Walter A. Johnson, Samuel J. Craig, and Irving L. Ashkenas Dec. 1973 59 p refs
(Contract NAS2-6441)
(NASA-CR-114698; STI-TR-1015-2) Avail: NTIS HC $6.00 CSCL 01C

A study aimed at the implementation of a configuration management flight control system is reported. The system is designed to take the guesswork out of, and improve the operational safety of, transition flight in the region from cruise to STOL. Potential improvements in the trim configuration management aspects of the transition process are described. D.L.G.

N74-22672# Cranfield Inst. of Technology (England). Coll. of Aeronautics.

THE WEIGHT, ECONOMIC AND NOISE PENALTIES OF SHORT HAUL TRANSPORT AIRCRAFT RESULTING FROM THE REDUCTION OF BALANCED FIELD LENGTH

D. Howe Jan. 1974 39 p refs

(Cranfield-Aero-24) Avail: NTIS HC $5.00

Design studies of short haul transport aircraft in reduced takeoff and landing, short takeoff and landing, and vertical takeoff and landing categories are analyzed to establish their respective performance penalties relative to the conventional landing and takeoff types of aircraft. The main criteria used for comparison are weight, direct operating costs, and 80 PNdb noise footprint areas. Some consideration is also given to low speed control characteristics. The basis of all the designs was a requirement to carry 108 passengers over a range of 600 nautical miles plus reserves. Author

N74-22673# National Aerospace Lab., Tokyo (Japan).

DYNAMIC RESPONSES OF THE STRUCTURAL MODEL WITH BUILT-UP WINGS AND A FUSELAGE (1)

Taketoshi Hanawa and Keiji Komatsu Dec. 1973 46 p refs In JAPANESE; ENGLISH summary

(NAL-TR-350) Avail: NTIS HC $5.50

The application of an analytical method to the analysis of the dynamic responses of a structural model which consists of the built-up wings and fuselage which is unrestrained or cantilevered at the rear end of the fuselage, and has been subjected to an external force with the form of a half-sine wave in time variation. The approximate natural vibration modes are calculated by the analysis of Rayleigh-Ritz procedure and have the characteristic of mathematical orthogonality between these modes. It is concluded that this method can be used to obtain the approximate responses at the beginning of the structural design when it is subjected to gust loads in flight or in the wind tunnel. Author

N74-22674# National Aerospace Lab., Tokyo (Japan).

AN OBSERVATION ON SPANWISE DISTRIBUTION OF VERTICAL ATMOSPHERIC TURBULENCE

Koichi Ono, Tokuo Sotozaki, Kazuyki Takeuchi, and Kosaburo Yamane Oct. 1973 21 p refs In JAPANESE; ENGLISH summary

(NAL-TR-346) Avail: NTIS HC $4.25

In the design calculation of airplane response to vertical atmospheric turbulence, spanwise distribution of turbulence velocities has been assumed to be uniform both in discrete gust method and in power spectral method. The actual spanwise distribution, however, is not uniform, and theoretical analyses of two-dimensional power spectral method by Diederich and others are tried with the assumption that the atmospheric turbulence is isotropic. In order to investigate the applicability of the assumption on the spanwise distribution in both methods, the vertical turbulence velocities were measured by an airplane at the nose and wing tips. Vertical velocity correlations along the flight path and the span were compared with each other and with the theoretical value by von Karman model. Also, the data measured at three points were analized to see the deviation from the assumption of spanwise uniform distribution by cross spectral method. Author

N74-22675# National Aerospace Lab., Tokyo (Japan).

TEST OF A SWEPT-BACK WING MODEL CONDUCTED IN THE NAL 2m X 2m TRANSONIC WIND TUNNEL

Masao Ebihara, Shinsaku Segawa, and Tokio Okonogi Oct. 1973 44 p refs In JAPANESE; ENGLISH summary

(NAL-TR-339) Avail: NTIS HC $5.25

Transonic wind tunnel tests of a sweptback wing model are reported. The model is designed to have uniform isobar pressure distribution over the upper surface at the design conditions of Mach 0.8 and the lift coefficient of 0.3. The half-wing model test procedure was used to permit incorporation of static pressure taps on the model upper surface. The objective of the test was to determine the range of validity of the test methods employed. Author

N74-22676*# Systems Technology, Inc., Hawthorne, Calif.

ANALYTICAL DESIGN AND SIMULATION EVALUATION OF AN APPROACH FLIGHT DIRECTOR SYSTEM FOR A JET STOL AIRCRAFT

Richard H. Klein, Lee Gregor Hofmann, and Duane T. McRuer Jan. 1974 100 p refs

(Contract NAS2-6441)

(NASA-CR-114697; STI-TR-1015-1) Avail: NTIS HC $8.00 CSCL 01C

A program was undertaken to develop design criteria and operational procedures for STOL transport aircraft. As part of that program, a series of flight tests shall be performed in an Augmentor Wing Jet STOL Aircraft. In preparation for the flight test programs, an analytical study was conducted to gain an understanding of the characteristics of the vehicle for manual control, to assess the relative merits of the variety of manual control techniques available with attitude and thrust vector controllers, and to determine what improvements can be made over manual control of the bare airframe by providing the pilot with suitable command guidance information and by augmentation of the bare airframe dynamics. The objective of the study is to apply closed-loop pilot/vehicle analysis techniques to the analysis of manual flight control of powered-lift STOL aircraft in the landing approach and to the design and experimental verification of an advanced flight director display. Author

N74-22677# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.

ANALYSIS OF MANEUVERABILITY EFFECTS ON ROTOR/WING DESIGN CHARACTERISTICS

K. C. Hansen, J. C. McKeown, and W. H. Gerdes Feb. 1974 209 p refs

(Contract DAAJ02-70-C-0033; DA Proj. 1X1-64206-D-378)

(AD-775833; SER-50681; USAAMRDL-TR-74-23) Avail: NTIS CSCL 01/3

The study presents the results of an analytical investigation of the effects of maneuverability on the design of a pure or winged helicopter. The Sikorsky general helicopter simulation and the normal mode blade aerolastic program were used to study the influence of rotor and wing sizing and design characteristics on the obtainable level of aircraft maneuverability. Obstacle-avoidance maneuvers were evaluated at a 150-knot cruise speed at 4000 feet, 95F. Rotor solidity, tip speed and disc loading, as well as wing size and incidence, were varied to optimize the designs for several levels of maneuverability. (Modified author abstract) GRA

N74-22678# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Aerodynamique et Structures.

CONTRIBUTION TO THE STUDY OF WEAK TORSION RIGIDITY WINGS [CONTRIBUTION A L'ETUDE DES AILES DE FAIBLE RIGIDITE EN TORSION]

Herve Courteville and Bernard Greselle 1973 125 p In FRENCH

Avail: NTIS HC $9.25

A project for a high performance glider with plastic wings is presented. A study of the torsional stresses was considered and calculations of the circulation, elastic deformation, and loads were carried out for a set of given characteristic parameters of the glider. The results are given in graphical form from which compromise solutions may easily be found. A practical example is detailed. ESRO

N74-22679# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Aerodynamique 2.

HINGE MOMENT AND EFFICIENCY OF AN ELEVATOR IN SUPERSONIC FLIGHT [MOMENT DE CHARNIERE ET EFFICACITE D'UN ELEVON EN SUPERSONIQUE]

Jacques Malavergne and Louis Tanguy 1973 108 p refs In FRENCH

Avail: NTIS HC $8.50

A theoretical and experimental study of hinge torque and efficiency for elevators in supersonic flow is presented. The shock and linear theories are compared and discussed for three Mach numbers. A linearized theory of conic flow is presented differentiating against external and internal flaps, effect of incidence of the whole wing, and incidence and deflection of flaps. The Eward theory was used and compared with other methods. The experimental methodology and results are detailed. The discussion evidences the superiority of the conical flow theory. ESRO

N74-22680# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Structures.

THERMAL LOADS IN THE REAR FUSELAGE OF CONCORDE AIRCRAFT [CONTRAINTES THERMIQUES DANS LA PARTIE ARRIERE DU FUSELAGE CONCORDE]

Jean Pierre Chapuis and Alain DeMarchi 1973 117 p refs In FRENCH

Avail: NTIS HC $9.00

A study on thermal stresses in the aft fuselage part of the Concorde aircraft is presented. Aerodynamic heating and thermal stresses in relation to the specific beam/girder structure are discussed. Temperatures at selected nodes were calculated together with temperature distribution within the structure. Mechanical stresses were calculated using the free beam theory and the results are discussed. Thermal stresses calculated by the displacement method were compared to mechanical stresses and the coupling between thermal state and mechanical state is discussed. Results of in-flight monitoring of extensometers are detailed. ESRO

N74-22681# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Acoustique et Turbomachines 1.

SOUND INSULATION OF THE TRS 18 MICROTURBO TURBOJET, PART 1 [INSONORISATION DU TURBOREACTEUR TRS 18 MICROTURBO]

Gilbert Grasmuck, Christian LeHir, and Josef Speth 1973 286 p refs In FRENCH

Avail: NTIS HC $17.50

A study of possible methods for noise reduction in a turbojet engine is presented. A series of acoustic measurements were performed and results discussed. A damping device on the compressor walls with slotted plates was found to be an efficient silencer. Nozzle noise was reduced by using suction trunks or annular nozzle. Experimental results are detailed and discussed. An economic analysis was performed and possible improvements are outlined based on the best performant solution (annular nozzle). ESRO

N74-22682# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Electronique 3.

INFORMATION MANAGEMENT BY BUS BARS (ONBOARD SYSTEM) [GESTION DES INFORMATIONS PAR BARRE BUS (SYSTEME EMBARQUE)]

Didier Blauwart, Jean Jacques Hordesseaux, and Jean Marie Marchand 1973 111 p refs In FRENCH

Avail: NTIS HC $8.75

A study for information management by bus bars for onboard aircraft equipment is presented. The system structure and information flows necessary are discussed in terms of normal/emergency dialogue, bus bar structure, series-word structure, bit encoding, redundant encoding, and bit rates. Technological problems pertaining to the nature of the transmission line, branching components, noise, and power supplies are detailed. Reliability in terms of recon figurable processors is discussed together with fail safe, failure detection devices. Various possible solutions are examined in general terms and criteria for the choice of a given solution are detailed. A simulation outfit is presented and various interfaces with signal sources, receptors, and display unit, are dealt with. ESRO

N74-22683# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Automatique 1.

REAL TIME IDENTIFICATION OF AIRCRAFT PARAMETERS. CONTRIBUTION TO THE SELF ADAPTIVE GUIDANCE [IDENTIFICATION EN TEMPS REEL DES PARAMETRES D'UN AVION. CONTRIBUTION AU PILOTAGE AUTO-ADAPTATIF]

Francis Beaujard, Visvasam Dumont, and Francois Guignard 1973 103 p refs In FRENCH

Avail: NTIS HC $8.25

A study on real time identification aircraft parameters for self adapting optimal automatic piloting is presented. The aircraft longitudinal movement differential equations were derived and simulated on a hybrid computer consisting of a digital computer T1600 and an analog computer ALPAM 500 interfaced by an analog to digital converter and a multiplexer. The procedures for numerical identification and the informative nature of the signals are discussed. The implementation of the identification is detailed and graphical results are given. The extension of the identification to the case of variable parameters and noisy signals was carried out, and aircraft control in view of identification with perturbed variables is discussed. The computing algorithms used and analog input data acquisition procedures are detailed. ESRO

N74-22684# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Automatique 2.

STUDY AND STABILIZATION OF LATERAL MOTION OF MODERN TRANSPORT AIRCRAFT [ETUDE ET STABILISATION DES MOUVEMENTS LATERAUX D'UN AVION DE TRANSPORT MODERNE]

Gerard Guillot and Jean Pierre Passani 1973 119 p refs In FRENCH

Avail: NTIS HC $9.00

A study for the stabilization of lateral motion in heavy passenger transport aircraft is presented. The stabilization can be achieved by the use of a yaw damping device. The natural lateral movements of the aircraft are discussed theoretically. Flight mechanics differential equations were established and linearized. Theoretical determination of the yaw damper was performed. A numerical study of the differential equation system is detailed while the case of jet engine power loss is treated on an analog computer. The yaw damper electronic circuit is presented. Its properties were checked with the help of an analog computer in six cases of typical flight conditions. The problems of matching the damper to the aircraft are discussed in terms of input signal demodulation, input/output impedance matching, and system reliability. ESRO

N74-22685# European Space Research Organization, Paris (France).

TACHISTOSCOPIC INVESTIGATIONS ON ELECTRONIC AND CONVENTIONAL COCKPIT DISPLAYS

W. Heinze Mar. 1974 54 p refs Transl. into ENGLISH of Tachistoskopische Untersuch. an elektron. und konventionellen Anzeigen fuer die Flugfuehrung, DLR-FB-73-27, DFVLR, 1973 (ESRO-TT-38; DLR-FB-73-27) Avail: NTIS HC $5.75; DFVLR, Porz, West Ger. 13.50 DM

In connection with investigations into the possible application of electronically produced data representation for flight guidance and control, a comparison of electromechanical and electronic indicating instruments was carried out by means of a tachistoscope. The measured results showed significantly better identification performance in the case of the electronic display than in the case where corresponding conventional indicator instruments were used. It can be proved that confusion is probable when the usual symbology for horizon and horizontal bar flight director display is employed. For the ILS and flight director displays, results were obtained which will be useful in the design of future displays. Author (ESRO)

N74-22686# Texas A&M Univ., College Station. Engineering Experiment Station.

APPLICATION TO ROTARY WINGS OF A SIMPLIFIED AERODYNAMIC LIFTING SURFACE THEORY FOR UNSTEADY COMPRESSIBLE FLOW, PART 1 Final Report

Balusu M. Rao and William P. Jones Jan. 1974 12 p refs Presented at AHS/NASA-Ames Specialists' Meeting on Rotorcraft Dyn., 13-15 Feb. 1974

(Contract DAHC04-74-G-0041)

(AD-775418; TEES-3023-74-01-Pt-1; AROD-12156-1-E) Avail: NTIS CSCL 01/3

In a recent paper, Jones and Moore have developed a simple numerical lifting surface technique for calculating the aerodynamic coefficients on oscillating wings in subsonic flight. The method is based on the use of the full lifting surface theory and is not restricted in any way as to frequency, mode of oscillation or aspect ratio when M is less than 1. In this study, this simple but general method of predicting airloads is applied to helicopter rotor blades on a full three-dimensional basis. (Modified author abstract) GRA

N74-22687# Battelle Columbus Labs., Ohio. Defense Systems and Technology Office.
BALLOON TECHNOLOGY DATA BASE. VOLUME 2: INDEX
E. E. Westbrook, J. E. Mortland, and E. N. Wyler Oct. 1973 304 p Sponsored by ARPA 2 Vol.
(AD-775383) Avail: NTIS CSCL 01/3

The compilation is made up of extracts representing documents held in the Balloon Technology Data Base. It is presented in two separately bound volumes: Volume I - Report Extracts and Volume II Index. Volume 2 is a computer-generated index of the extracts in Volume 1. Each extract has been indexed by authors and appropriate terms. Although no Thesaurus has been developed, an effort has been made to maintain consistency in the use of terms. The citations accompanying each term are complete; it was thought that this would give the searcher more information upon which to base his decisions than would a simple accession number or title. GRA

N74-22688# Army Aviation Systems Test Activity, Edwards AFB, Calif.
HELICOPTER ICING SPRAY SYSTEM QUALIFICATION Final Report, 13 Apr. - 5 Jul. 1973
James S. Hayden, Edward E. Bailes, Joseph C. Watts, and Larry K. Brewer Oct. 1973 90 p refs
(AD-775803) Avail: NTIS CSCL 01/2

The United States Army Aviation Systems Test Activity conducted an engineering evaluation of the CH-47C helicopter incorporating the icing spray system designed and built by a contractor. The evaluation was conducted during the period 13 April through 5 July 1973 at Edwards Air Force Base, California. The evaluation consisted of handling qualities and water droplet size and distribution calibrations, and involved 38 test flights totaling 27.5 productive flight hours. The CH-47C icing spray system handling qualities were evaluated in the long boom configuration and an attempt was made at evaluation in the short boom configuration. (Modified author abstract) GRA

N74-22689# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PREDICTION OF AIRCRAFT GROUND PERFORMANCE BY EVALUATION OF GROUND VEHICLE RUT DEPTHS Final Report, Jan. - Jul. 1973
G. W. Turnage and D. N. Brown Feb. 1974 125 p refs
(AF Proj. 683M)
(AD-775744; AFWL-TR-73-213) Avail: NTIS CSCL 01/3

Two single aircraft tires (20-20, 22-PR and 49-17, 26-PR) and three standard military trucks were tested under towed (nonpowered, nonbraked) and self-powered conditions, respectively, in buckshot clay test beds whose strengths ranged from about 110 to 600 cone index. Tests included multiple passes over the prepared test beds (usually 100 passes for the aircraft tires, 10 for the trucks) at low speeds. Only single-wheel configurations were examined (i.e., outer second- and third-axle wheels of the M35A2 and M51 were removed). Curves were developed to allow soil strength (airfield index) to be estimated directly from the rut produced by single or multiple passes of any of the three trucks. These curves were developed through use of a dimensionless prediction term (tire-clay numeric Nc) that allows pneumatic tire performance to be scaled over a wide range of soil strengths, wheel loads, and tire size, shape, and deflection conditions. (Modified author abstract) GRA

N74-22690# Summa Corp., Culver City, Calif. Hughes Helicopters Div.
OH-6A DESIGN AND OPERATIONAL FLIGHT LOADS STUDY Final Report
R. Boocock, L. L. Erle, J. F. Needham, G. D. Roeck, and H. G. Smith Jan. 1974 103 p refs
(Contract DAAJ02-72-C-0061; DA Proj. 1F1-62204-AA-82)
(AD-775832; HH-73-14; USAAMRDL-TR-73-21) Avail: NTIS CSCL 01/1

An analysis and correlation of OH-6A helicopter engineering design values and actual operational values recorded in Southeast Asia is presented. The operational data are based on USAAMRDL Technical Report 71-60, Flight Loads Investigation of OH-6A Helicopters Operating in Southeast Asia. The parameters involved include mission profiles, rotor drive system, and main and tail rotor fatigue load spectra, damage rates, and service lives. Recommendations are made for additions and changes to improve the structural design criteria for future Army observation helicopters. Author (GRA)

N74-22691# United Aircraft Corp., Stratford, Conn. Sikorsky Aircraft Div.
HELICOPTER TRANSMISSION MODULARIZATION AND MAINTAINABILITY ANALYSIS Final Report, 27 Jun. 1972 - 27 Mar. 1973
Jules G. Kish, Paul Menkes, and Kenneth R. Cormier Jan. 1974 236 p refs
(Contract DAAJ02-72-C-0106; DA Proj. 1F1-62205-A-119)
(AD-775834; SER-64373; USAAMRDL-TR-73-82) Avail: NTIS CSCL 01/3

The objective of the transmission modularization analysis was to develop a methodology to evaluate helicopter transmission modularization and to demonstrate the feasibility, methods, design criteria, and cost effectiveness of modularization. A U.S. Army CH-54B helicopter was selected for the analysis and designs were completed for transmissions with seven, six, four and three modules. A mathematical model was derived that calculated the cost and performance characteristics of a helicopter with a modularized transmission. A computer program was written to implement the mathematical model. (Modified author abstract) GRA

N74-22692# Kaman Aerospace Corp., Bloomfield, Conn.
POSITIVE-ENGAGEMENT CLUTCH Final Technical Report
Charles J. Wirth Dec. 1973 93 p refs
(Contract DAAJ02-72-C-0055; DA Proj. 1G1-62207-AA-72)
(AD-775835; R-1180; USAAMRDL-TR-73-96) Avail: NTIS CSCL 01/3

Overrunning clutches are universally used in helicopter drive systems to couple the engine and rotor in powered flight while permitting rotor autorotation with the engine stopped. The clutches in current use depend on friction for power transmission, and suffer from structural inefficiency which imposes a weight penalty and centrifugal influences which restrict operating speed. The positive-engagement overrunning clutch described herein offers the possibility of better structural efficiency and lifting of the overrunning speed limitation. This clutch transmits power through splines, and suffers no detriment to overrunning operation from centrifugal force. A positive-engagement clutch was designed to meet the operating and space requirements of the HLH helicopter, and a test program was conducted to explore the operating characteristics of the clutch. (Modified author abstract) GRA

N74-22693# Kaman Aerospace Corp., Bloomfield, Conn.
HELICOPTER SECONDARY STRUCTURES RELIABILITY AND MAINTAINABILITY INVESTIGATION Final Report
Patrick J. Cunningham and William A. Smyth Jan. 1974 154 p
(Contract DAAJ02-72-C-0069; DA Proj. 1F1-62205-A-119)
(AD-775836; R-1176; USAAMRDL-TR-73-100) Avail: NTIS CSCL 01/3

The purpose of the report is to define new or modified design/test criteria which, when applied to the design of new helicopter secondary structures, will enhance their maintainability and reliability. In pursuance of this aim, criteria pertinent to secondary structures were abstracted from existing literature. The contractor's data on secondary structures were analyzed, and components exhibiting high maintenance and failure rates were identified. A correlation check was performed between existing criteria and experienced failure modes, and new criteria were defined which had potential for eliminating or reducing the experienced failures or maintenance actions. (Modified author abstract) GRA

N74-22694# Boeing Vertol Co., Philadelphia, Pa.
TEST RESULTS REPORT AND TECHNOLOGY DEVELOPMENT REPORT, HLH/ATC DRIVE SYSTEM AFT ROTOR SHAFT BEARING TEST Final Report, Sep. 1971 - Mar. 1973
Joseph W. Lenski, Jr. Jan. 1974 87 p refs
(Contract DAAJ01-71-C-0840)
(AD-775897; T301-10207-1; USAAMRDL-TR-73-92) Avail:

NTIS CSCL 01/3

The report presents the results of a program to define criteria and to design, fabricate, and test simulated HLH aft rotor shaft tapered roller bearings. Tests were performed in a back-to-back test rig which simulated the expected loading, lubrication, housing stiffness, and preload of the HLH aft rotor shaft application. Technical test inspection and evaluation were used to determine bearing performance and adequacy of bearing fatigue life under predicted operating conditions. Trade studies conducted of the HLH aft rotor shaft support bearing show that large-pitch-diameter and high-contact-angle duplex tapered roller bearings provide the most effective method of reacting the HLH rotor loads. This bearing configuration resulted in the lightest weight and most compact bearing system for the HLH aft rotor shaft bearing application. (Modified author abstract) GRA

N74-22695# Beta Industries, Inc., Dayton, Ohio.
DESIGN OF ESCAPE CAPSULE LATERAL LANDING IMPACT PROTECTION SYSTEM Final Report, Oct. 1971 - Jan. 1973
Norman S. Phillips, Richard S. Scranton, Richard W. Carr, and Lyle D. Gailbraith Jan. 1974 94 p refs Prepared in cooperation with Rocket Res. Corp., Redmond, Wash.
(Contract F33615-71-C-1862; AF Proj. 7231)
(AD-776066; BII-221; AMRL-TR-73-21) Avail: NTIS CSCL 01/2

The ultimate objective of the program was the design and development of an inflatable lateral body support system. The program also included the design and development of a special test apparatus, configured to represent the salient features of a crew escape module, which could be used on the AMRL HYGE sled facility to test inflatable restraints in escape capsule lateral impact conditions. Design criteria were collected from airbag systems manufacturers and crash pulse and tolerance data were found from several sources. A stored gas, direct, and aspirated flow system was selected as the best for the tests to be conducted and the system was developed by Rocket Research Corporation, Redmond, Washington. Based upon existing crash pulse data, the same system should provide adequate capability to study inflatable restraint response and protection for light fixed-wing aircraft and fixed-wing transport crash pulses. (Modified author abstract) GRA

N74-22696# Air Force Weapons Lab., Kirtland AFB, N.Mex.
AN ECOLOGICAL STUDY OF GULL POPULATIONS TO REDUCE THE BIRD-AIRCRAFT STRIKE HAZARD AT CHARLESTON AIR FORCE BASE Final Report, 1 Jun. 1971 - 1 Jun. 1972
Dennis M. Forsythe Feb. 1974 93 p refs
(AF Proj. 683M)
(AD-776001; AFWL-TR-73-42) Avail: NTIS CSCL 01/2

Activities related to the bird-aircraft strike hazard at Charleston AFB, South Carolina, were studied in a 500-square-mile coastal area from 1 June 1971 to 1 June 1972. Ring-billed, Herring, and Laughing Gulls were the main species present: 2,500 Ring-billed Gulls and 2,500 Herring Gulls during winter, and 2,200 Laughing Gulls during summer. Ring-billed and Herring Gulls had increased in numbers in the study area since 1957, and were the major bird hazards to air traffic safety at the air base. In all, 14 bird-aircraft strikes occurred at Charleston AFB during the study, compared with 33 in the previous year. Of the 14 strikes, 6 to 9 were by Ring-billed or Herring Gulls, and the others were by blackbirds or starlings, pigeons, Cattle Egrets, and unidentified species. Recommendations to reduce the bird-aircraft strike hazard include zoning for solid-waste disposal sites, and improving bird-control techniques at the air base. (Modified author abstract) GRA

N74-22697# Technology, Inc., Dayton, Ohio.
HELICOPTER DRIVE SYSTEM LOAD ANALYSIS Final Report
Raymond B. Johnson, Jr. and Terry L. Cox Jan. 1974 68 p refs
(Contract DAAJ02-73-C-0012; DA Proj. 1G1-62204-AA-72)
(AD-775858; USAAMRDL-TR-73-105) Avail: NTIS CSCL 01/3

To study the overtorque conditions of three Army helicopter types - the AH-1G, UH-1H, and OH-6A - and the potential effect of such conditions on the maintenance procedures and design criteria for these helicopters was the prime objective of the reported research. To this end, approximately 755 hours of previously documented multichannel oscillogram data, recorded under combat conditions in the Vietnam theater, were reprocessed and reanalyzed to investigate the extent and significance of engine and transmission operations that exceeded specific torque pressure limits for each helicopter type. (Modified author abstract) GRA

N74-22698# Aerophysics Co., Washington, D.C.
INCLUSION OF TIP RELIEF IN THE PREDICTION OF COMPRESSIBILITY EFFECTS ON HELICOPTER ROTOR PERFORMANCE Final Report
John M. LeNard and Gabriel D. Boehler Dec. 1973 65 p refs
(Contract DAAJ02-72-C-0031; DA Proj. 1F1-62206-AA-61)
(AD-775857; AR-59; USAAMRDL-TR-73-71) Avail: NTIS CSCL 01/3

The tip relief effect on the performance of helicopters operating at high subsonic tip Mach numbers is calculated. The theoretical method based on the complementary wing model for tip relief is applied. The method of application in complex blade element computer program is described and results are presented. Similarly, the technique and results from a simplified application for use in energy type prediction methods are given. Since tip relief is closely connected with the problem of predicting the compressible power loss of rotors, and techniques for predicting this power loss are reviewed and discussed in detail. Author (GRA)

N74-22699# Air Force Weapons Lab., Kirtland AFB, N.Mex.
A REVIEW OF PUBLICATIONS ON THE BIRD-AIRCRAFT Final Report, 15 Oct. - 9 Nov. 1973
Claude L. Scott and Rutherford C. Wooten, Jr. Mar. 1974 18 p
(AF Proj. 683M)
(AD-775731; AFWL-TR-74-11) Avail: NTIS CSCL 01/2

The United States Air Force (USAF) annually spends millions of dollars for the replacement or repair of aircraft components damaged by bird-aircraft collisions. Since March 1969, the Air Force has had an active research and development program at the Air Force Weapons Laboratory (AFWL) to reduce the bird-aircraft strike hazard. The report reviews those Technical Notes (TNs) and Technical Reports (TRs) that have been published as a result of the research effort. Author (GRA)

N74-22700# Bell Helicopter Co., Fort Worth, Tex.
AH-1G DESIGN AND OPERATIONAL FLIGHT LOADS STUDY Final Report
Max E. Glass, David L. Kidd, and John P. Norvell Jan. 1974 100 p refs
(Contract DAAJ02-72-C-0099; DA Proj. 1F1-62204-A-170)
(AD-775838; BHC-209-099-371; USAAMRDL-TR-73-41) Avail: NTIS CSCL 01/1

The report compares AH-1G helicopter Southeast Asian mission profiles with the original engineering frequency-of-occurrence spectrum and the Navy AR-56 spectrum for attack helicopters. Fatigue lives calculated using the Southeast Asian profile are compared with those determined using the original frequency-of-occurrence spectrum. The development cycle of the Bell Helicopter Company Model 540 rotor system is reviewed, and the fatigue design methods used are presented. Maximum one-time occurrences measured in the Southeast Asian operational survey are compared wirh those specified in the AH-1G structural design criteria and those measured in structural demonstration flight tests. Recommendations are made regarding future mission surveys, the structural surveys, the structural design criteria for attack helicopters, and the upgrading of rotor loads prediction capability. Author (GRA)

N74-22701# Army Air Mobility Research and Development Lab., Fort Eustis, Va.
DEVELOPMENT OF MANUFACTURING METHODS FOR BALLISTICALLY TOLERANT FIBERGLASS TUBULAR BELLCRANKS
I. E. Figge, Sr. Jan. 1974 35 p refs
(AD-775818; USAAMRDL-TM-73-105) Avail: NTIS CSCL 01/3

The purpose of this investigation was to develop manufacturing methods for the ballistically tolerant tubular/sandwich CH-47 forward bellcrank with the goals of optimizing production costs and weight, while achieving structural repeatability. Complete fabrication details are presented. Ballistic, fatigue, and static tests, conducted at -65F, 75F, and 180F, showed that the bellcrank met the design requirements. The manufacturing techniques developed resulted in both substantial weight savings (1.65 pounds compared to 3.4 pounds for a metal bellcrank) and cost savings ($68.60 compared to $135.00). A slotting technique that localized the ballistic damage on the exit face sheet and prevented gross delaminations was developed. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-22702*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ENERGY CONVERSION RESEARCH AND DEVELOPMENT WITH DIMINIODES
James F. Morris 1974 18 p refs Presented at Inst. of Elec. and Electron. Engr., Knoxville, Tenn., 15-17 May 1974
(NASA-TM-X-71533; E-7936) Avail: NTIS HC $4.00 CSCL 10A

Diminiodes are variable-gap cesium diodes with plane miniature guarded electrodes. These converters allow thermionic evaluations of tiny pieces of rare solids. In addition to smallness, diminiode advantages comprise simplicity, precision, fabrication ease, parts interchangeability, cleanliness, full instrumentation, direct calibration, ruggedness, and economy. Diminiodes with computerized thermionic performance mapping make electrode screening programs practical. Author

N74-22703*# Techtran Corp., Glen Burnie, Md.
THE MEASUREMENT OF LARGE WIND ENERGY GENERATORS
C. Martini Washington NASA May 1974 16 p Transl. into ENGLISH from Elektrotech. Maschinenbau (Austria), v. 57, no. 7/8, 17 Feb. 1939 p 83-89
(Contract NASw-2485)
(NASA-TT-F-15433) Avail: NTIS HC $4.00 CSCL 10A

The weight comparison of energy generators according to the Honnef System is represented in curves wherein the weight is plotted as a function of three variables: the number of poles, air induction, and diameter. Author

N74-22704*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
WORKSHOP PROCEEDINGS: PHOTOVOLTAIC CONVERSION OF SOLAR ENERGY FOR TERRESTRIAL APPLICATIONS. VOLUME 1: WORKING GROUP AND PANEL REPORTS
1973 117 p Proc. held at Cherry Hill, N. J., 23-25 Oct. 1973 2 Vol.
(Contract NAS7-100; Grant NSF AG-485)
(NASA-CR-138209; NSF-RA-N-74-013-Vol-1; JPL-SP43-3-Vol-1) Avail: NTIS HC $9.00 CSCL 10A

Technological aspects of solar energy conversion by photovoltaic cells are considered. The advantage of the single crystal silicon solar cell approach is developed through comparisons with polycrystalline silicon, cadmium sulfide/copper sulfide thin film cells, and other materials and devices. G.G.

N74-22705*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
WORKSHOP PROCEEDINGS: PHOTOVOLTAIC CONVERSION OF SOLAR ENERGY FOR TERRESTRIAL APPLICATIONS. VOLUME 2: INVITED PAPERS
1973 294 p refs Proc. held at Cherry Hill, N. J., 23-25 Oct. 1973 Sponsored by NASA 2 Vol.
(Grant NSF AG-485)
(NASA-CR-138193; NSF-RA-N-74-013-Vol-2; JPL-SP43-3-Vol-2) Avail: NTIS HC $17.75 CSCL 10A

A photovoltaic device development plan is reported that considers technological as well as economical aspects of single crystal silicon, polycrystal silicon, cadmium sulfide/copper sulfide thin films, as well as other materials and devices for solar cell energy conversion systems. G.G.

N74-22706*# Rockwell International Corp., Downey, Calif. Space Div.
INTEGRATED POWER/ATTITUDE CONTROL SYSTEM (IPACS) STUDY. VOLUME 1: FEASIBILITY STUDIES Final Report
J. E. Notti, A. Cormack, III, and W. C. Schmill Washington NASA Apr. 1974 303 p 2 Vol.
(Contract NAS1-11732)
(NASA-CR-2383; SD-73-SA-0101-1) Avail: NTIS HC $7.25 CSCL 10C

An Integrated Power/Attitude Control System (IPACS) concept consisting of an array of spinning flywheels, with or without gimbals, capable of performing the dual function of power storage and generation, as well as attitude control has been investigated. This system provides attitude control through momentum storage, and replaces the storage batteries onboard the spacecraft. The results of the investigation are presented in two volumes. The trade-off studies performed to establish the feasibility, cost effectiveness, required level of development, and boundaries of application of IPACS to a wide variety of spacecraft are discussed. The conceptual designs for a free-flying research application module (RAM), and for a tracking and data relay satellite (TDRS) are presented. Results from dynamic analyses and simulations of the IPACS conceptual designs are included. Author

N74-22707*# Rockwell International Corp., Downey, Calif. Space Div.
INTEGRATED POWER/ATTITUDE CONTROL SYSTEM (IPACS) STUDY. VOLUME 2: CONCEPTUAL DESIGNS Final Report
J. E. Notti, A. Cormack, III, W. C. Schmill, and W. J. Klein Washington NASA Apr. 1974 214 p refs 2 Vol.
(Contract NAS1-11732)
(NASA-CR-2384; SD-73-SA-0101-2-Vol-2) Avail: NTIS HC $5.75 CSCL 10C

For abstract, see N74-22706.

N74-22708*# Kanner (Leo) Associates, Redwood City, Calif.
STATISTICAL SUMMARY AND EVALUATION OF VENTO-ELECTRIC POWER STATION OUTPUT (PART 2 OF 2)
D. R. Stein Washington NASA Jun. 1974 16 p refs Transl. into ENGLISH from Elextrizitaetswirtschaft (Frankfurt am Main), v. 50, no. 11, Nov. 1951 p 325-329
(Contract NASw-2481)
(NASA-TT-F-15652) Avail: NTIS HC $4.00 CSCL 10A

Data obtained from the operation of windmills in Denmark were used to study the performance of several sizes and designs. Tabulated information shows: (1) how performance is affected by wind velocity patterns, particularly mean velocities, by rotor diameter, and by how the output is used; (2) what fraction of available wind is utilized; (3) how regularly or irregularly output varies with time; (4) what peak values occur; (5) the duration of lulls; and (6) how utilization time depends upon the power level used as a reference. Author

N74-22709*# Techtran Corp., Glen Burnie, Md.
MEETING FUTURE PEAK ELECTRICAL ENERGY DEMANDS BY MEANS OF ELECTROCHEMICAL STORAGE SYSTEMS
Klaus D. Beccu Washington NASA May 1974 12 p refs Transl. into ENGLISH from Chem.-Ingr.-Tech., v. 46, no. 3, 1974 p 95-99 Presented at the Session of GDCh Specialist Group Appl. Electrochem., Ludwigshafen am Rhein, West Germany, 4-5 Oct. 1973
(Contract NASw-2485)
(NASA-TT-F-15634) Avail: NTIS HC $4.00 CSCL 10C

The electrical energy crisis is considered in terms of storage equipment. Various types are compared in terms of costs, efficiency, maintenance, and raw material reserves. It is concluded that more study and research is needed before adequate energy storage systems can cover peak load periods. Author

N74-22710*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
UNCERTAINTIES IN PREDICTING SOLAR PANEL POWER OUTPUT
Bruce Anspaugh 15 Apr. 1974 47 p refs
(Contract NAS7-100)
(NASA-CR-138455; JPL-TM-33-673) Avail: NTIS HC $5.50 CSCL 10A

The problem of calculating solar panel power output at launch and during a space mission is considered. The major sources of uncertainty and error in predicting the post launch electrical performance of the panel are considered. A general discussion of error analysis is given. Examples of uncertainty calculations are included. A general method of calculating the effect on the panel of various degrading environments is presented, with references supplied for specific methods. A technique for sizing a solar panel for a required mission power profile is developed. Author

N74-22711# Army Electronics Command, Fort Monmouth, N.J.
COMPARISON OF METHYL ACETATE AND 4-BUTYROLACTONE IN APROTIC ORGANIC ELECTROLYTES
Carol K. Pearce Mar. 1974 23 p refs
(DA Proj. 1T1-61102-A-34A)
(AD-775787; ECOM-4203) Avail: NTIS CSCL 10/3

The search for high energy density batteries is proceeding along several paths, of which one is the organic electrolyte system. Some studies associated with attaining the optimum electrolyte are discussed. Two organic electrolytes, solutions of lithium perchlorate in 4-butyrolactone or methyl acetate, were examined. Conductivity and viscosity values were determined and compared. The electrochemical behavior of the electrolytes was investigated in lithium/organic electrolyte/carbon monofluoride depolarizer cells. Polarization and galvanostatic discharge characteristics are presented, and the energy content values compared for cells containing the organic electrolytes. Problems encountered with the use of the electrolytes are discussed. Author (GRA)

N74-23260* Kanner (Leo) Associates, Redwood City, Calif.
IMPROVEMENT OF ELECTRIC CHARACTERISTICS OF LEAD ACCUMULATORS UNDER THE ACTION OF ULTRASOUNDS
V. P. Mihu and I. Gavrila *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 204-209 refs
Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica, Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 265-269
(For availability see N74-23226 14-23)
CSCL 10C

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-22712*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
REFLECTANCE MODEL OF A PLANT LEAF
R. Kumar and L. Silva 1973 29 p
(Grant NGL-15-002-112)
(NASA-CR-138251; LARS-IN-022473) Avail: NTIS HC $4.50 CSCL 06C

A light ray, incident at 5 deg to the normal, is geometrically plotted through the drawing of the cross section of a soybean leaf using Fresnel's Equations and Snell's Law. The optical mediums of the leaf considered for ray tracing are: air, cell sap, chloroplast, and cell wall. The above ray is also drawn through the same leaf cross section considering cell wall and air as the only optical mediums. The values of the reflection and transmission found from ray tracing agree closely with the experimental results obtained using a Beckman DK-2A Spectroreflectometer. Similarly a light ray, incident at about 60 deg to the normal, is drawn through the palisade cells of a soybean leaf to illustrate the pathway of light, incident at an oblique angle, through the palisade cells. Author

N74-22713*# Massachusetts Univ., Amherst. Dept. of Biochemistry.
CHANGES IN SULFHYDRYL GROUPS OF HONEYBEE GLYCERALDEHYDE PHOSPHATE DEHYDROGENASE ASSOCIATED WITH GENERATION OF THE INTERMEDIATE PLATEAU IN ITS SATURATION KINETICS
W. G. Gelb, J. F. Brandts, and J. H. Nordin [1973] 42 p refs
(Grant NGL-22-010-029)
(NASA-CR-138379) Avail: NTIS HC $5.25 CSCL 06A

Honeybee and rabbit muscle GPDH were studied to obtain information at the chemical level regarding anomolous saturation kinetics of the honeybee enzyme. Results demonstrate that the enzyme's sulfhydryl groups are implicated in the process. Measured by DTNB titration, native honeybee GPDH has one less active SH than the native rabbit muscle enzyme and displays changes in overall sulfhydryl reactivity after preincubation with G-3-P or G-3-P plus NAD+. The total DTNB reactive sulfhydryls of rabbit muscle GPDH are not changed by preincubation with NAD+ or G-3-P; honeybee GPDH, under certain conductions of preincubation with these ligands, shows a decrease of two total DTNB reactive SH groups. This difference has been confirmed by an independent experiment in which the two enzymes were carboxymethylated with C-14 bromoacetic acid. Author

N74-22714*# Colorado State Univ., Fort Collins.
[NARCOSIS STUDIES AND OXYGEN POISONING OF MICE]
Semiannual Status Report
31 Oct. 1973 51 p refs
(Grant NGR-06-002-075)
(NASA-CR-137458) Avail: NTIS HC $5.75 CSCL 06C

The research for a mechanism by which narcotic gases alter metabolism is reported. Possible sites of action by narcotic and anesthetic gases in isolated electron transport particles were explored. Using the relative activities of the NADH-oxygen, NADH-ferricyanide, succinate-cytochrome C and succinate-NAD oxidoreductase systems as parameters, the relative potency of volatile anesthetics were tested. Testing the relative ability of human subjects to contract and repay an oxygen debt while in the narcotic versus alert state, it was found that narcosis induced by 33% nitrous oxide increased the size of the oxygen debt contracted and the amount of oxygen required to repay it during recovery. Mice acclimatized to sea level (760 mm Hg), 5000 feet (632 mm Hg) or 15,000 feet 437 mm Hg) for from one to eight weeks were found to be more susceptible to convulsion and death as a function of altitude acclimatization when tested in hyperoxic environments. There were no reasonable explanations for the connection between hypoxia and oxygen poisoning but several practical implications for persons living at altitude are discussed. Author

N74-22715*# Techtran Corp., Glen Burnie, Md.
PATHOLOGICAL PHYSIOLOGY OF EXTREMAL STATES IN EXOGENIC INTOXICATIONS
S. N. Golikov, P. D. Gorizontov, ed., and N. N. Sirotinin, ed. Washington NASA May 1974 38 p refs Transl. into ENGLISH from the book "Patologicheskaya Fiziologiya Ekstremalnykh Sostoyaniy" Moscow, Meditsina Press, 1973 p 267-289
(Contract NASw-2485)
(NASA-TT-F-15321) Avail: NTIS HC $5.00 CSCL 06E

Data systemization of toxicological pathophysiology exogenic intoxicators was studied using modern concepts and mechanisms which define the action of various poisons. Characteristics, symptoms, syndromes, treatment, and prevention were considered in addition to the extremal states of shock, collapse, coma, and agony. Author

N74-22716*# Techtran Corp., Glen Burnie, Md.
THE MOTOR PRESENT STATE IN MAN UNDER WATER IMMERSION CONDITIONS
A. V. Ovsyannikov Washington NASA May 1974 10 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (Leningrad), v. 58, no. 3, Mar. 1972 p 305-310
(Contract NASw-2485)

(NASA-TT-F-15563) Avail: NTIS HC $4.00 CSCL 06S

The functional state of the segmental apparatus before voluntary movement was investigated in subjects under water immersion conditions. The H-reflex was used to evaluate the excitability of the spinal cord motoneurons. On the third, fourth, and fifth days of water immersion the increase in motoneuron pool excitability began 30 msec before EMG rather than the normal 60 msec. The absence of increase in excitability over the interval of 60-30 msec prior to movement is considered to be the consequence of disuse of the suprasegmental nervous structure involved in the spinal postural readjustment mechanisms. Author

N74-22717*# Kanner (Leo) Associates, Redwood City, Calif.
THE BED
Washington NASA May 1974 7 p refs Transl. into ENGLISH from S. African Med. J. (Capetown), v. 43, no. 11, Mar. 1969 p 289-290
(Contract NASw-2481)
(NASA-TT-F-15582) Avail: NTIS HC $4.00 CSCL 06S

Some of the pathological effects of bed rest on the patient are discussed: the heart's work production increases by 30% in the prone position; autonomic nervous control of vascular tonus is curtailed; excretion of calcium and nitrogen increases; incontinence is often found in older patients. Recent considerations about the therapeutic value of bed rest, and a re-evaluation of its efficacy, give rise to changes in hospital planning. Author

N74-22718*# Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS OF CARDIAC RHYTHM DURING ATHEROSCLEROSIS AND HYPERTONIA IN SURGICAL PATIENTS USING A SPECIALIZED COMPUTER
M. I. Kuzin, E. A. Bogdanova, V. A. Sakharov, and N. G. Khaltayev Washington May 1974 14 p refs Transl. into ENGLISH from Klinich. Med. (Moscow), no. 12, Dec. 1973 p 19-24
(Contract NASw-2481)
(NASA-TT-F-15583) Avail: NTIS HC $4.00 CSCL 06P

Measurements of 400 intervals on the EGG were recorded with an accuracy to 1 msec in 64 patients and 30 healthy individuals. Interval histograms were analyzed and cardiointervalograms are presented in figures and graphic form, EGG, polycardiograms, respiration curves. The cardiac rhythm was more stable in patients than in healthy individuals, especially in cases of marked changes in the contractile capacity of the myocardium. In the group of patients with a more variable rhythm, there were observed changes in the conducting system of the heart. Dynamic observations in the course of the preoperative preparation showed that variability criteria can be used for the control of the conducted therapy. Author

N74-22719*# Kanner (Leo) Associates, Redwood City, Calif.
SENSE AND NONSENSE ABOUT BED REST AS A THERAPEUTIC MEASURE
G. Brueschke, J. Haase, J. Herrmann, and D. Voigt Washington NASA May 1974 9 p refs Transl. into ENGLISH from Deut. Gesundheitsw. (West Germany), v. 24, 1969 p 2465-2467
(Contract NASw-2481)
(NASA-TT-F-15586) Avail: NTIS HC $4.00 CSCL 06E

The practice of undiscriminatingly confining patients to bed is criticized. Confinement to bed causes more physical and psychic complications than other pharmocotherapeutic measures and some of these complications are described. Expanded opportunities for physical exercise for hospitalized patients are urged with immobilization restricted to the part of the body for which it is absolutely required. Author

N74-22720*# Kanner (Leo) Associates, Redwood City, Calif.
THE EFFECT OF PROLONGED BODILY INACTIVITY ON CARBOHYDRATE TOLERANCE
Otfried Guenther and Rainer Frenzel Washington NASA May 1974 13 p refs Transl. into ENGLISH from Z. Gesam. Inn. Med. (East Germany), v. 24, 1969 p 814-817
(Contract NASw-2481)
(NASA-TT-F-15587) Avail: NTIS HC $4.00 CSCL 06P

The influence of prolonged bodily inactivity on carbohydrate tolerance was investigated. Prednisone-glucose-tolerance tests were conducted at 4-week intervals on 20 patients confined to bed for at least 8 weeks because of diseases known not to have any direct influence on carbohydrate metabolism. In two cases, the patients were reexamined 2 years after remobilization. The following results were obtained: (1) Reductions in carbohydrate tolerance can be brought about by prolonged bodily inactivity alone. (2) The more complete the immobilization, and the longer it lasts, the greater the impairment of carbohydrate metabolism. (3) Carbohydrate tolerance reductions due to confinement in bed are observed almost exclusively in older persons. (4) As a rule, these disturbances of carbohydrate metabolism are reversible after remobilization. Author

N74-22721*# Scientific Translation Service, Santa Barbara, Calif.
THE PROBLEM OF STRUCTURAL ANALYSIS OF BIOLOGICAL RHYTHMS
D. S. Sarkisov Washington NASA May 1974 19 p refs Transl. into ENGLISH from Arkh. Patol. (Moscow), v. 35, no. 12, 1973 p 3-11
(Contract NASw-2483)
(NASA-TT-F-15592) Avail: NTIS HC $4.00 CSCL 06P

Several patterns in the adaptation reaction of the human body when stimuli are applied at various rhythms are studied. Electron microscopy, autoradiography and histochemistry are used for a structural analysis of adaptation reactions of the body at the intracellular level. Author

N74-22722*# Kanner (Leo) Associates, Redwood City, Calif.
A STUDY ON THE ROLE OF THE BRAIN IN THE ESTABLISHMENT OF ADAPTATION TO REPEATED IMMOBILIZATION STRESS. PART 1: CHANGES IN BRAIN ACTIVITY AND BODILY FUNCTIONS UNDER REPEATED IMMOBILIZATION STRESS
Masahiro Yanase Washington NASA May 1974 38 p refs Transl. into ENGLISH from J. Japan. Physiol. Soc., v. 35, 1973 p 109-124
(Contract NASw-2481)
(NASA-TT-F-15603) Avail: NTIS HC $5.00 CSCL 06P

A 6-hour immobilization was applied to rabbits for 7 successive days and the establishment of adaptation was investigated. Decreases in food intake, water intake and urine volume in the early stage of the application were reversed after repeated stresses. Although the first immobilization effected decreases in rectal temperature, glucose tolerance, oxidation of glucose and short chain fatty acids in liver slices, and changed the response of the heart rate to mecholyl, the seventh immobilization had little effect on these. Therefore, adaptation to the immobilization can be considered to appear after repeated exposures to stress. The threshold of stimulation in the midbrain reticular formation inducing neocortical EEG arousal decreased under the immobilization stress, and that in the dorsomedial nucleus of the thalamus increased. Changes in multiple unit activity in the ventromedial nucleus, anterior hypothalamic area, preoptic area and hippocampus under the first immobilization stress diminished with repeated stresses. Author

N74-22723*# Kanner (Leo) Associates, Redwood City, Calif.
THE EFFECT OF LOCAL APPLICATION OF Ca, K, AND Na ON THE TEMPERATURE CENTER STIMULATED BY VARIOUS PYROGENIC SUBSTANCES
O. Kym Washington NASA May 1974 27 p refs Transl. into ENGLISH from Arch. Exp. Pathol. Pharmakol. (Berlin), v. 176, 1934 p 408-424
(Contract NASw-2481)
(NASA-TT-F-15629) Avail: NTIS HC $4.50 CSCL 06P

Intercerebral injection of CaCl2 in rabbits prevented the fevers normally produced by intramuscular injection of beta-tetrahydronaphthylamine, ergotoxin, or hay infusion. When administered in the course of a fever produced by one of these agents, CaCl2 halted the temperature rise and soon returned temperature to normal levels. Neither NaCl nor KCl showed these effects. Intracerebral injection of CaCl2 also caused disturbances of balance. Anatomical localization of the calcium injections in the tuber region indicated the presence there of certain thermoregulatory and static-regulation systems. Author

N74-22724# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC

AFFAIRS NO. 409
3 May 1974 49 p refs Transl. into ENGLISH from Eastern Europe reports
(JPRS-61905) Avail: NTIS HC $5.50

The age related changes of the cardiovascular system, visual and auditory organs, along with mental acuity and psychonervous stresses that effect the flight fitness of pilots is discussed. Case histories are presented concerning the morbidity of nephrolithiasis in pilots and the effects on flight fitness. For individual titles, see N74-22725 through N74-22726.

N74-22725 Joint Publications Research Service, Arlington, Va.
PILOTS: MIDDLE AGE; PHYSICAL FITNESS
W. Schur *In its* Trans. on Eastern Europe: Sci. Affairs No. 409 (JPRS-61905) 3 May 1974 p 28-36 Transl. into ENGLISH from Z. Militaermed. (East Berlin), Nov. 1973 p 325-329 (For availability see N74-22724 14-04)

Middle aged pilots evidence age-related decrease in fitness which is of special concern in relation to their competence. These factors of biological age are discussed in terms of flight fitness: chronologic age; physical or physiological age; mental age; and emotional age. The age related changes of the cardiovascular system, visual and auditory organs, as well as mental acuity and psychonervous stresses are discussed. Conditioning and acceptance of a well planned flight training program can contribute significantly to the maintenance of professional fitness of pilots after the age of 40. K.M.M.

N74-22726 Joint Publications Research Service, Arlington, Va.
NEPHROLITHIASIS AND FLIGHT FITNESS: SELECTED CASES
G. Poenisch, E. Richter, and W. Schur *In its* Transl. on Eastern Europe: Sci. Affairs No. 409 (JPRS-61905) 3 May 1974 p 37-41 refs Transl. into ENGLISH from Z. Militaermed. (East Berlin), Nov. 1973 p 329-330 (For availability see N74-22724 14-04)

Consideration is given to data on the morbidity, manifestations, and recurrence tendency of nephrolithiasis in pilots as they pertain to aviation medicine and the problem of flight qualifications. Three typical cases are presented and discussed. Author

N74-22727# Advisory Group for Aerospace Research and Development, Paris (France).
MANUAL OF AERONAUTICAL MEDICINE AND APPLICATION TO NAVIGATION PERSONNEL [MANUEL DE MEDECINE AERONAUTIQUE A L'USAGE DU PERSONNEL NAVIGANT]
T. G. Dobie (RAF) Dec. 1972 280 p In FRENCH
(AGARDograph-154(FR); AGARD-AG-154(FR)) Avail: NTIS HC $17.00

Diverse aerospace medical data are summarized. Summaries cover: mental and physical health, respiration and circulation, hypoxia prevention, pressure reduction effects, and effects of extreme heat on the body. Data are also given on air sickness, noise and vibration, cabin pressurization and rapid decompression, vision, and survival. Several other related topics were also summarized. Transl. by E.H.W.

N74-22728*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ADENOSINE TRIPHOSPHATE (ATP) AS A POSSIBLE INDICATOR OF EXTRATERRESTRIAL BIOLOGY
Emmett W. Chappelle and Grace Lee Picciolo Washington May 1974 10 p refs
(NASA-TN-D-7680; G-7457) Avail: NTIS HC $3.00 CSCL 06C

The ubiquity of adenosine triphosphate (ATP) in terrestrial organisms provides the basis for proposing the assay of this vital metabolic intermediate for detecting extraterrestrial biological activity. If an organic carbon chemistry is present on the planets, the occurrence of ATP is possible either from biosynthetic or purely chemical reactions. However, ATP's relative complexity minimizes the probability of abiogenic synthesis. A sensitive technique for the quantitative detection of ATP was developed using the firefly bioluminescent reaction. The procedure was used successfully for the determination of the ATP content of soil and bacteria. This technique is also being investigated from the standpoint of its application in clinical medicine. Author

N74-22729*# Techtran Corp., Glen Burnie, Md.
THE EFFECT OF PATHOGENIC FACTORS OF THE ARCTIC, ANTARCTICA AND AQUANAUTICS
F. A. Morokhov Washington NASA May 1974 36 p refs Transl. into ENGLISH from the book "Patologicheskaya Fiziologiya Exstremalnykh Sostoyaniy" Moscow, Med., 1973 p 349-369
(Contract NASw-2485)
(NASA-TT-F-15325) Avail: NTIS HC $5.00 CSCL 06S

The pathological physiology of acclimatization processes and the extreme conditions occurring in response to the varied conditions of Antarctica, the Arctic, and aquanautics are examined by way of analysis of individual extreme factors and the changes in the organism caused by them. Along with description of the pathological aspects of the various sets of conditions, recommendations are made for prophylatic measures to be taken to counteract the pathological influences. Author

N74-22730*# Scientific Translation Service, Santa Barbara, Calif.
THE HEART IN OBESITY, CLINIC
H. Schwalb and G. Schimert Washington NASA May 1974 22 p refs Transl. into ENGLISH from Med. Klin. (Munich), v. 65, 1970 p 1908-1913
(Contract NASw-2483)
(NASA-TT-F-15588) Avail: NTIS HC $4.25 CSCL 06P

A review of the medical literature covering the effects of obesity on the heart is presented. Cardiovascular damage primarily identified are coronary sclerosis, hyperlipidemia, hypertonia, fatty degeneration, reduced functional range, reduction in physical exercise, increased volume load, disturbed respiration, electrocardiograph pathology, and angina pectoris. Author

N74-22731*# Scientific Translation Service, Santa Barbara, Calif.
ESSENTIAL OBESITY
F. Matzkies Washington NASA May 1974 15 p refs Transl. into ENGLISH from fortschr. Med. (Munich), v. 90, 1972 p 765-768
(Contract NASw-2483)
(NASA-TT-F-15589) Avail: NTIS HC $4.00 CSCL 06P

Obesity is overweight by more than 10 kg. Essential obesity indicates unknown etiology. All cases derive from overeating for long periods, with lesser contribution from reduced exercise. Obesity reduces life expectance through changes in the cardiovascular system, lungs, digestive organs, skeleton, and endocrine glands. The first step in therapy is motivating the patient to reduce weight. The usual measure is a reducing diet, especially with carbohydrate limitation. Formula diets are useful, and extensive weight loss can be attained by fasting under medical observation. Drugs are usually undesirable because of their side effects. Author

N74-22732# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 8, NO. 2, 1974
24 May 1974 147 p refs Transl. into ENGLISH of Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974, p 1-90
(JPRS-62082) Avail: NTIS HC $10.50

Summaries are given of data on the training and selection of cosmonauts. Summary data cover: evaluation and analysis of accumulated data to facilitate the on-going transition from orbital to interplanetary flights, research aimed at guaranteeing safety on long flights and reliability of the human component of the man-spaceship system, space psychology and physiology, environmental problems and control, and telemetry. For individual titles, see N74-22733 through N74-22751.

N74-22733 Joint Publications Research Service, Arlington, Va.
CYTOLOGICAL AND CYTOGENETIC EFFECTS IN THE CELLS OF BACTERIA AND MAMMALS UNDER THE INFLUENCE OF ACCELERATED HEAVY IONS
Yu. G. Grigoryev, N. I. Ryzhov, B. S. Fedorenko, Ye. A. Krasavin, S. V. Vorozhtsova, L. A. Koshcheyeva, N. Ya. Savchenko, and V. F. Khlaponina *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 3-8 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8,

no. 2, Mar. - Apr. 1974 p 3-8 (For availability see N74-22732 14-04)

Studies were made of the biological effectiveness of post-radiation recovery processes and factors modifying radiological effects brought about by the action of heavy ions and standard radiations on bacterial E. coli B cells and mammalian cells. Heavy ions exhibited a more pronounced biological effect. Bacterial and mammalian cells exhibited somewhat similar responses to radiations with high linear energy losses (LEL). This is suggested by a similarity in the direction and picture of damage. There were also significant qualitative and quantitative differences related to the species and organization of the biological objects tested. This applies mainly to the different relationships between the relative biological effect changes and LEL. Author

N74-22734 Joint Publications Research Service, Arlington, Va.
EFFECTS OF HYPOKINESIA ON THE LIPID COMPOSITION OF THE BLOOD AND TISSUES IN RABBITS OF DIFFERENT AGE
Yu. P. Rylnikov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 8-13 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 8-13 (For availability see N74-22732 14-04)

Rabbits of two groups (older animals aged 2 to 2 1/2 years weighing 3.5 to 5.0 kg and younger animals aged 1 to 1 1/2 years weighing 2.5 to 3.0 kg) were confined in small cages. The exposure was accompanied by an increase in cholesterol in the blood, heart and liver. This increment was greater in animals of the older group. This was clearly expressed in the liver tissue. The level of total lipids in the heart and liver increased, conforming to the same pattern. The content of phosphatids in the heart and aorta decreased at the expense of sphingomyelins, lecithin, and kephalin in the older group and at the expense of lecithin and kephalin in the younger group. The dropoff in oxygen consumption was more clearly expressed in the older group. Accordingly, hypokinetic exposure in older age groups favors the development of atherosclerosis. Author

N74-22735 Joint Publications Research Service, Arlington, Va.
CELL CHANGES IN RAT LIVERS DURING HYPOKINESIA
S. Ye. Li and O. I. Kirillov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 13-17 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 13-17 (For availability see N74-22732 14-04)

Male rats of the Wistar line weighing 95 to 100 g were kept under hypokinetic conditions. Five to nine test and control animals were sacrificed after 12 hours, two, six, nine, 14 and 19 days. The nuclear size, mitotic index, and number of binucleate cells in the liver were determined. During hypokinesia the absolute weight of the liver decreased whereas its relative weight increased. Nuclear ploidy decreased, the mitotic index declined and the number of binucleate cells more than doubled. It is assumed that some polyploid cells are transformed into binucleate cells which in turn are divided into mononuclear diploid cells. Author

N74-22736 Joint Publications Research Service, Arlington, Va.
HYDROGEN BACTERIA AS A POSSIBLE SOURCE OF PROTEIN IN FOOD FOR MAN AND ANIMALS
V. I. Foanov, V. K. Kovalenkova, I. T. Troitskaya, L. A. Sletskaya, A. V. Novikova, and L. V. Vasilyeva *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 17-20 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 17-20 (For availability see N74-22732 14-04)

A study was made of the nutritional value of proteins from a biomass of hydrogen bacteria Hydrogenomonas eutropha of the Z-I group on a Schlegel medium in Vedenina's modification. Before feeding animals the polymer of beta-hydroxybutyric acid was extracted with chloroform. A high biological value of the proteins from the biomass of hydrogen bacteria was demonstrated. Further investigations of the biochemical composition of the biomass are needed with respect to the changes noted in kidney tissues. Author

N74-22737 Joint Publications Research Service, Arlington, Va.
EFFICIENCY IN USING THE PRODUCTS OF FORMALDEHYDE CONDENSATION IN THE SYNTHESIS OF CARBOHYDRATES c06
V. A. Uspenskaya and G. M. Petrova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 20-24 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 20-24 (For availability see N74-22732 14-04)

The catalytic activity of synthetic carbohydrates formed during formaldehyde condensation was investigated. It was experimentally demonstrated that the formaldehyde condensate which was not treated with sorbents exhibited a higher capacity for activating the reaction of formaldehyde condensation to sugars. The efficiency of an organic cocatalyst increased substantially when a half condensate was used in its place. This may help to reduce energy requirements and to bring about mild conditions for the synthesis. Author

N74-22738 Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF METHYL ALCOHOL FROM CO2 AND H2 AS AN INTERMEDIATE PRODUCT OF CARBOHYDRATE PRODUCTION c06
M. G. Rozenfeld, M. T. Rusov, S. K. Sachenko, and Yu. Ye. Sinyak *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 24-28 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 24-28 (For availability see N74-22732 14-04)

Data are given on the parameters of methanol synthesis which provide the maximum level of carbon dioxide and hydrogen conversion and the maximum yield of methanol as an intermediate product of carbohydrate regeneration in a small enclosure. The maximum yield of methanol takes place when there is a stoichiometric ratio of the initial components. The maximum degree of gas utilization is dependent on their concentration in the initial medium. Author

N74-22739 Joint Publications Research Service, Arlington, Va.
PECULIARITIES OF REACTION OF THE RAT CEREBELLUM TO EXPOSURE TO CENTRIPETAL ACCELERATIONS AFTER PROLONGED HYPOKINESIA
L. D. Klimovskaya and N. P. Smirnova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 29-34 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 29-34 (For availability see N74-22732 14-04)

White rats kept under conditions of prolonged hypokinesia were exposed to transverse accelerations Gx of 6 and 10 g. In acute experiments the induced activity of the cerebellar cortex was investigated in Nembutal-anesthesized rats before, during, and after rotation on a centrifuge. The amplitude of the electric response of the cerebellar cortex to stimulation of the sciatic nerve was found to increase on the 14th day of hypokinesia. The cerebellar response to acceleration decreased on the 35th to 40th days of hypokinesia and increased on the 55th to 60th days. In all stages of hypokinesia the force ratio was disturbed: on the 14th and on the 55th to 60th days responses to accelerations of 6 and 10 g became more dissimilar. A decrease in kinesthetic afferentation and a general increase in excitation due to stress effects contributed to the development of functional disorders in the cerebellar cortex during hypokinesia. Author

N74-22740 Joint Publications Research Service, Arlington, Va.
DYNAMICS OF CIRCULATORY INDICES IN THE CREW OF THE SALYUT ORBITAL STATION DURING AN EXAMINATION UNDER REST CONDITIONS
V. A. Degtyarev, V. G. Doroshev, N. D. Kalmykova, Z. A. Kirillova, and N. A. Lapshina *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 34-42 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 34-42 (For availability see N74-22732 14-04)

The main results of complex investigations of blood circulation for the crew of the Salyut orbital station under hypokinetic conditions are given. It was found that the levels of arterial pressure, blood output, work, and intensity of contraction of the left ventricle were relatively high. The dynamics of the principal

indices of circulation during weightlessness has its specific peculiarities. One can observe the syndrome of shortening of the phase of isovolumetric contraction of the left ventricle, a considerable amplitude of fluctuations of individual indices during repeated investigations, and an influence of accompanying factors associated with the crew's current activity aboard the station on the dynamics of circulation. Analysis of data in dependence on times of exposure to weightlessness did not exhibit a clear tendency in the change of most of the registered indices which could be related to the cumulative effect of weightlessness.
Author

N74-22741 Joint Publications Research Service, Arlington, Va.
SOME PROBLEMS IN INTERACTION BETWEEN THE VESTIBULAR AND VISUAL ANALYZERS
A. Ye. Kurashvili and V. I. Babiyak *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 42-50 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 42-50 (For availability see N74-22732 14-04)

A study was made of the influence of the vestibular analyzer on fixation and tracking motions of the eye. Stimulation of the vestibular apparatus was accomplished by the rotation and calorization methods: oculomotor reactions were registered using an improved electrooculogram method. The authors studied the problem of visual perception of space coordinates and its modification under the influence of rotation and electric stimulation of the vestibular apparatus. The conclusion is drawn that the vestibular system, as a system sensing extrasubjective gravitational space constants, is most important in the formation of visual concepts of space coordinates. These concepts are reflected in the objective characteristics of oculomotor reactions. Author

N74-22742 Joint Publications Research Service, Arlington, Va.
CLINICAL-PHYSIOLOGICAL ASPECTS OF EARLY FORMS OF AUTOMATIC-VASCULAR DISORDERS
A. Ya. Tizul and E. I. Matsnev *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 76-82 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 50-54 (For availability see N74-22732 14-04)

Examinations of 71 persons with polymorphous autonomic-vascular disturbances allowed clinical and physiological characterization of early forms of the dysfunctions which develop in so-called clinically healthy persons in the age group 25 to 40 years. Autonomic disorders occurred in 33.8% of the intellectuals who were not regularly engaged in physical work or sports. In addition to clinical tests, diagnosis of autonomic-vascular dysfunctions included specific provocative and training tests, the results of which were very important for the study and evaluation of autonomic reactions. Most patients with various mild clinical manifestations of autonomic dysfunctions exhibited a decline in the range of adaptive and compensatory capabilities of the human body which is manifested in an unsatisfactory tolerance to functional tests. Author

N74-22743 Joint Publications Research Service, Arlington, Va.
CHANGES IN THE ELECTROCARDIOGRAM DURING ACUTE HYPOXIA AND THEIR SIGNIFICANCE
V. B. Malkin and V. I. Plakhatnyuk *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 83-92 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 54-61 (For availability see N74-22732 14-04)

The use of hypoxic hypoxia -- ascent to an altitude of 5,000 m in a normal atmosphere -- as a provocative test for detecting latent cardiac pathology is described and summarized. In 12,000 tests during which electrocardiographic studies were made of healthy male test subjects and subjects with neurocirculatory dystonia, in the age group 20 to 45 years, 3.66% of the cases exhibited ECG changes which were beyond the normal limits. In 82.93% of the cases conditionally pathological changes in the ECG were related to various disorders in the cardiac rhythm. In 9.33% of the cases they were related to conductivity disturbances and in 7.74% of the cases they were related to changes in the terminal part of the ventricular complex. Disorders in cardiac rhythm at an altitude of 5,000 m were the development or acceleration of extrasystolic events. During rare ventricular extrasystoles in hypoxia they either disappeared or were enhanced. Author

N74-22744 Joint Publications Research Service, Arlington, Va.
EFFECT OF AN INCREASED CARBON DIOXIDE CONTENT ON THE PHAGOCYTIC ACTIVITY OF NEUROPHYILS AND THE LEVEL OF SIALIC ACIDS IN THE HUMAN BLOOD
M. V. Markaryan *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 93-96 refs Transl. into ENGLISH from Kosm. Biol. Aviakos. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 61-63 (For availability see N74-22732 14-04)

A five-day exposure of man to an increased 3 to 5% carbon dioxide concentration in a small sealed chamber inhibited the phagocytic activity of neutrophils and reduced the level of sialic acids in the blood serum. A correlation was established between the carbon dioxide content in the inhaled air and the level of changes in the mentioned parameters. The highest level of phagocytic inhibition and decrease in sialic acid occurred when breathing a 5% carbon dioxide atmosphere. Author

N74-22745 Joint Publications Research Service, Arlington, Va.
STUDY OF ORGANIZATION OF A FLIER'S ATTENTION DURING INSTRUMENT FLIGHT c05
I. D. Malinin and V. A. Ponomarenko *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 97-102 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 64-68 (For availability see N74-22732 14-04)
Avail: NTIS

An attempt was made to examine the phenomenon of switching of attention during instrumented flight from the point of view of the probability theory. To solve this problem, the method of evaluation of the distribution of attention of a flier from instrument to instrument using a concealed motion picture survey of his eyes was used. The motion picture films were interpreted using keys which represent the image of the fixed glance of the flier at the time of fixation of the eyes on each of the pilotage navigation instruments. Results indicate that the function of distribution and switching of attention during instrument flight is a determined and organized form of mental behavior for a flier in the aircraft control process. E.H.W.

N74-22746 Joint Publications Research Service, Arlington, Va.
EVALUATION OF THE FUNCTIONAL STATE OF THE MYOCARDIUM IN FLIGHT PERSONNEL DETERMINED FROM CLINICAL-INSTRUMENTAL INVESTIGATIONS
V. M. Kondrakov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 103-107 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 68-71 (For availability see N74-22732 14-04)

Electrocardiographic changes, polycardiographic, and hemodynamic parameters were analyzed in 146 pilots in the age group 39 to 57. With respect to ECG changes, the subjects (in the second group) with diffuse ECG changes exhibited a phase hypodynamic syndrome, a decrease in cardiac output, strength, and output of the left ventricle. Thirty percent of the first group subjects with a normal ECG exhibited changes in the early systolic phases, the energy parameters of cardiac activity indicating an inadequate contractability of the cardiac muscle. A comparative analysis of these changes helps in an objective evaluation of the functional capabilities of the cardiovascular system, in formulating a proper diagnosis of the disease, and in recommending rational treatment, as well as in making a well-substantiated expert decision. Author.

N74-22747 Joint Publications Research Service, Arlington, Va.
PRINCIPLES IN FORMULATING OPTIMUM SLEEP AND WAKEFULNESS REGIMES FOR MAN DURING PROLONGED SPACE FLIGHTS c05
A. N. Litsov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 108-114 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 71-75 (For availability see N74-22732 14-04)

The main steps which can be taken to prevent unfavorable responses to cosmonauts to changes in workrest schedules are as follows: development of optimum schedules, their good agreement with the biorhythmological peculiarities of every crew member, and preliminary adaptation of cosmonauts to the new cycle under favorable conditions on the earth. The optimum regimes are the routine regimes to which man normally adheres. Relatively optimum regimes are those which provide a rapid but incomplete rearrangement of the cycle. Nonoptimum regimes are those which are not followed by a synchronization of the basic functions of the human body and the altered environment. The optimum level of the diurnal cycle is dependent to a certain extent on the duration of sleep and wakefulness periods, their change and fractionation, distribution of work and rest. Author

N74-22748 Joint Publications Research Service, Arlington, Va.
AUTOMATIC MODELING OF SATURATION AND DESATURATION PROCESSES IN THE BODY BY AN INERT GAS WITH A CHANGE IN PRESSURE
M. V. Propp *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 116-126 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 75-82 (For availability see N74-22732 14-04)

A decrease in pressure of an atmosphere containing inert gases can cause different types of decompression disorders. An examination was made of methods for the automatic modeling of the process of saturation and desaturation of the body by an inert gas with a change in pressure using analog elements in which the gas is diffused through a porous barrier. The pressure change beyond the porous barrier corresponds to the pressure change in a definite group of tissues. Use of automatic computations with analog devices makes it possible to employ the optimum pressure decrease regime, shortens decompression time, and makes it possible to avoid computations from tables. The instruments can be used in diving, caisson work, in high-altitude, and space flights. Author

N74-22749 Joint Publications Research Service, Arlington, Va.
POSSIBILITIES OF USING A PHARMACOLOGIC AUTONOMIC BLOCKAGE (GANGLIOPLEGIA) IN AVIATION AND COSMONAUTICS
F. Smolyarek *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 127-132 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 83-85 (For availability see N74-22732 14-04)

The effect of ganglioplegia for the prevention and treatment of damage which can arise in response to extremal factors in aviation and space flights was investigated. Ganglioplegia preparations used included novacaine and its derivatives and curare. Author

N74-22750 Joint Publications Research Service, Arlington, Va.
EFFECT OF PROTAMINE-ADENOSINETRIPHOSPHATE ON THE VIABILITY OF LETHALLY IRRADIATED RATS
T. P. Pantev, N. V. Bokova, and I. A. Nikolov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 133-135 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 85-86 (For availability see N74-22732 14-04)

Data are presented on the synthesis of protamine-adenosinetriphosphate (PATP) and the results of an experimental study of its antiradiation properties. Experimental results show that the use of PATP as an ion residue bound with a radioprotective protein considerably reduces its toxicity, and at the same time sharply increases its protective effect. Author

N74-22751 Joint Publications Research Service, Arlington, Va.
INVESTIGATIONS IN THE FIELD OF AVIATION MEDICINE AT THE MILITARY-MEDICAL ACADEMY IMENI S. M. KIROV (ON THE 175TH ANNIVERSARY OF THE MILITARY-MEDICAL ACADEMY IMENI S. M. KIROV)
G. I. Gurvich and Z. K. Sulimo-Samuyllo *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 136-143 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 86-90 (For availability see N74-22732 14-04)

A historical account is given of research carried out in aviation medicine by the Military-Medical Academy imeni S. M. Kirov of the U.S.S.R. Investigations cover oxygen starvation, changes in the body under the influence of mechanical forces at the time of the change in body position, hydrostatic problems, and altitude tolerance. E.H.W.

N74-22752*# Kanner (Leo) Associates, Redwood City, Calif.
PATHOPHYSIOLOGICAL CHANGES IN BED REST
O. J. Malm Washington NASA May 1974 10 p refs Transl. into ENGLISH from Tidsskr. Norske Laegforen. (Norway), v. 89, 1969 p 478-480
(Contract NASw-2481)
(NASA-TT-F-15639) Avail: NTIS HC $4.00 CSCL 06P

The lack of discrimination shown by doctors in ordering bed rest for their patients is examined. Published experiences by the Romanian surgeon Liviu Campeanu and the accounts of the first surviving heart transplant patients are considered. In order to point out the very positive effects from getting a patient on his feet as quickly as possible. Among the many serious consequences of extended bed rest, the decline edemas are caused when a reduction in muscle mass is accompanied by a relative increase of free, gravitation susceptible fluid in the interstitial fluid space. The dangers to the respiratory and renal systems caused by gravitational pull on the supine system are cited. Author

N74-22753*# Scientific Translation Service, Santa Barbara, Calif.
MENTAL STATES DURING PROLONGED HYPOKINESIA
I. A. Maslov Washington NASA May 1974 8 p refs Transl. into ENGLISH from Zh. Nevropatol. i Psikhiatr. (Moscow), v. 68, 1968 p 1031-1034
(Contract NASw-2483)
(NASA-TT-F-15585) Avail: NTIS HC $4.00 CSCL 05J

Mental changes were studied in 6 male normal examinees in the age group from 23 to 36 years. All 6 examinees were put on a bed regimen for 62 days. In all the examinees the main form of mental change was expressed in a neurasthenic syndrome. A regular development was noted in the mental change which was conditioned by the premorbid features of the examinees. Psychological factors such as apprehension about the duration of the experiment were significant. It was concluded that change in the mental state of the examinees could be attributed to change in habitual life pattern, monotony of the environmental situation, and a certain degree of isolation. Author

N74-22754*# Techtran Corp., Glen Burnie, Md.
ENERGY TRANSFORMATION AND PULSE RATE WITH NEGATIVE MUSCULAR WORK
E. A. Mueller Washington NASA May 1974 9 p refs Transl. into ENGLISH from Arbeitsphysiologie (Berlin), v. 15, 1953 p 196-299
(Contract NASw-2485)
(NASA-TT-F-15606) Avail: NTIS HC $4.00 CSCL 06P

Tests employing a two-handed crank of constant revolution rate were conducted to determine performance in negative work in comparison to positive work. Three to four times higher performance was achieved in negative work. Author

N74-22755*# Techtran Corp., Glen Burnie, Md.
HEMATOLOGICAL ADJUSTMENT TO HIGH ALTITUDES
M. G. Rinbenbach Washington NASA May 1974 19 p refs Transl. into ENGLISH from Bordeaux Med., no. 17, Nov. 1973 p 2769-2777
(Contract NASw-2485)
(NASA-TT-F-15620) Avail: NTIS HC $4.00 CSCL 06P

Red blood corpuscle presence was studied in both venous and capillary blood in relation to high altitudes and mountain sickness. A three-phase adaptation of these corpuscles was found to high altitudes. Hematoporphyrine is demonstrated as useful in treating mountain sickness. Author

N74-22756*# Techtran Corp., Glen Burnie, Md.
FUNCTION AND RESPIRATORY RHYTHM IN OBESE PEOPLE
F. Liot, E. Bernier, D. Lemaigre, J. F. Dessanges, and S. Poenaru Washington NASA May 1974 15 p refs Transl. into ENGLISH from Ann. Med. Interne (Paris), v. 123, no. 11, Nov. 1972

p 993-1000
(Contract NASw-2485)
(NASA-TT-F-15631) Avail: NTIS HC $4.00 CSCL 06P

Respiratory rhythm in obese patients show that they have a low expiratory reserve. Obese patients suffering from chronic broncho-pneumopathy also have a high residual volume and a vital capacity reduction. Expiratory pauses often accompany their respiration similar to but still different from the Cheyne-Stokes syndrome. Author

N74-22757*# Techtran Corp., Glen Burnie, Md.
MEASUREMENT OF END-EXPIRATORY LUNG VOLUME (FRC) DURING EXERCISE
A. Huch Washington NASA May 1974 10 p refs Transl. into ENGLISH from Z. Prakt. Anaesthesiologie, v. 8, Jun. 1973 p 166-171
(Contract NASw-2485)
(NASA-TT-F-15640) Avail: NTIS HC $4.00 CSCL 06P

Various parameters of respiration in dogs under anesthesia are investigated. The possible use of these techniques for measuring lung parameters in working human subjects, since methodology eliminates any subjective cooperation between researcher and subject, are also examined. Author

N74-22758*# Techtran Corp., Glen Burnie, Md.
MYOGENIC CAUSES OF HEMOLYSIS
B. Bula, E. Ziobro, and Z. Sutylo Washington NASA May 1974 10 p refs Transl. into ENGLISH from Wychowanie Fizyczne i Sport, v. 10, no. 2, 1966 p 33-38
(Contract NASw-2485)
(NASA-TT-F-15649) Avail: NTIS HC $4.00 CSCL 06E

The numbers of erythrocytes and precentage of hemoglobin in plasma in 20 men, after subjection to cold showers and hard work, were investigated. Erythrocytes dropped in numbers and hemoglobin was found in plasma for up to an hour. Author

N74-22759*# Techtran Corp., Glen Burnie, Md.
PATHOGENESIS OF TRAUMATIC SHOCK AND CRUSHING DISEASE
S. A. Seleznev Washington NASA May 1974 56 p refs Transl. into ENGLISH from the publ. "Patologicheskaya Fiziologiya Ekstremalnykh Sostoyaniy" Moscow, Med., 1973 p 71-106
(Contract NASw-2485)
(NASA-TT-F-15316) Avail: NTIS HC $6.00 CSCL 06P

An historical survey is presented of the pathogenesis of shock, in the course of which the various pathological aspects are examined in detail. The pathological features of crushing and therapy for the consequences of crushing are considered within the framework of the discussion of shock. Author

N74-22760*# Scientific Translation Service, Santa Barbara, Calif.
BED REST AND NITROGEN BALANCE
H. Noelle Washington NASA May 1974 18 p refs Transl. into ENGLISH from Therap. Gegenwart (Munich), v. 103, Apr. 1964 p 509-526
(Contract NASw-2483)
(NASA-TT-F-15601) Avail: NTIS HC $4.00 CSCL 06P

Bed rest alone does not cause negative nitrogen balance. Patients requiring bed rest often have increased protein requirements because of effects of disease. Author

N74-22761*# Techtran Corp., Glen Burnie, Md.
DIAGNOSIS OF ORTHOSTATIC HYPOTONICITY
O. Thulesius and U. Ferner Washington NASA May 1974 16 p refs Transl. into ENGLISH from Z. Kreislaufforsch. (Darmstadt), v. 61, no. 8, Aug. 1972 p 742-754
(Contract NASw-2485)
(NASA-TT-F-15638) Avail: NTIS HC $4.00 CSCL 06E

Relationships between blood pressure and heart rate, and age, weight and height are investigated. Norms are derived for the general diagnosis of circulatory disturbances. Author

N74-22762*# Kanner (Leo) Associates, Redwood City, Calif.
CHANGES IN THE CONCENTRATION OF POTASSIUM SODIUM AND CALCIUM AS THE RESULT OF ENDURANCE EFFORT
E. Preisler and R. Kadza Washington NASA Jun. 1974 16 p refs Transl. into ENGLISH from Wychowanie Fizyczne i Sport, v. 11, no. 4, 1967 p 53-61
(Contract NASw-2481)
(NASA-TT-F-15654) Avail: NTIS HC $4.00 CSCL 06S

The potassium, sodium and calcium levels in the venous blood serum were measured in 122 persons, before and after endurance efforts of varying intensity (80 min track and field exercises, gymnastics, 1500 m swimming and bus driving). The potassium and sodium levels decreased after strenuous effort, whereas the calcium level tended to increase. Author

N74-22763# Institut Franco-Allemand de Recherches, St. Louis (France).
EFFECTS OF SONIC BANGS ON THE BEHAVIOR OF FISH (LEBISTES RETICULATUS OR GUPPY) [EFFETS DU BANG SUR LE COMPORTEMENT DES POISSONS (LEBISTES RETICULATUS OU GUPPY)]
A. Dancer, M. Schaffar, M. Hartmann, P. Cottereau (Ecole Natl. Vet., Lyon), L. Chavot (Ecole Natl. Vet., Lyong), and J. Pin (Ecole Natl. Vet., Lyon) 1973 29 p In FRENCH
(Contracts DRME/ISL-72/289;
DRME/ENVL-69/34-72800-480-7501)
(ISL-15/73) Avail: NTIS HC $4.50

A comparison of the effect of sonic booms on two populations of fish (guppy) is presented. One of the populations was subjected to sonic booms produced by the ISL generator. The experimental set-up is described. Results show that the only observed reactions are panic reactions of short duration (0.5 sec) which appear only for intensities higher than 1 mbar. ESRO

N74-22764# Institut Franco-Allemand de Recherches, St. Louis (France).
BIBLIOGRAPHY ON SHOCK WAVE EFFECTS ON HUMAN BEINGS [ACTION DES ONDES DE CHOC SUR L'ETRE VIVANT. RECUEIL DE DONNEES BIBLIOGRAPHIQUES]
P. Rigaud and A. Dancer 5 Jul. 1973 136 p refs In FRENCH
(ISL-NB-6/73) Avail: NTIS HC $10.00

A bibliography on shock wave effects on human beings and animals is presented. Approximately 733 references to 1970 are given. Topics include: theoretical considerations on shock waves, shock wave production, experimental techniques in various media, theory and experiments on human reactions to shock waves, specific aspects for various mammifers and fishes, physiological effects on various organs, lethal limits, influence of specific physical parameters (maximum pressure, shock front, etc.), pathological anatomy, therapeutics, and protection. ESRO

N74-22765# Medical Physics Inst. Utrecht (Netherlands).
STOCHASTIC ACTIVITY IN A POPULATION OF NEURONS. A SYSTEMS ANALYSIS APPROACH
Lars H. Zetterberg (Roy. Inst. of Tech., Stockholm) Jun. 1973 32 p refs
(TNO-MFI-2.3.153/1) Avail: NTIS HC $4.75

A functional model of a moderately large neural network has been established and is used to describe the response to certain stimulations. The model is essentially based on the work by Wilson and Cowan, but certain simplifications and generalizations have been introduced. The main interest is on the response to stochastic inputs, and it has been agreed that they may be considered Gaussian with either a flat spectrum or a colored one. In order to carry out the analysis, the nonlinear functions contained in the equations may first be linearized, while the influence from nonlinearities may be ascertained later by using a perturbation technique. ESRO

N74-22766# Naval Aerospace Medical Research Lab., Pensacola, Fla.
OPERANT BEHAVIOR OF RHESUS MONKEYS IN THE PRESENCE OF EXTREMELY LOW FREQUENCY-LOW INTENSITY MAGNETIC AND ELECTRIC FIELDS: EXPERIMENT 3 Medical Research Progress Report No. 3
John DeLorge 5 Nov. 1973 17 p refs
(MF51524015)
(AD-774106; NAMRL-1196) Avail: NTIS CSCL 06/18

The present study exposed two female rhesus monkeys to a magnetic field of 0.001 T alternating at 10 Hz and 60 Hz. Low intensity electric fields were simultaneously present. The fields did not influence operant response rates, reaction time, matching-to-sample or motor activity. This study, in addition to two similar studies with male animals, supports the contention that ELF electromagnetic fields of low intensity do not have effects on purposive behavior in rhesus monkeys. Author (GRA)

N74-22767# Childrens Hospital Medical Center, Boston, Mass. Dept. of Neurology.

DEPRESSION OF THE LECITHIN-CHOLESTEROL ACYLTRANSFERASE REACTION IN VITAMIN E DEFICIENT MONKEYS

Hubert S. Mickel, Penelope L. Hill, and K. C. Hayes 6 Feb. 1974 19 p refs
(Contract N00014-72-C-0059; NR Proj. 108-908)
(AD-773950) Avail: NTIS CSCL 06/1

Vitamin E deficiency in two species of monkeys reduced the esterification of cholesterol by the plasma lecithin-cholesterol acyltransferase reaction. The reduction was greatest in animals fed a diet rich in polyunsaturated fat and stripped of vitamin E. Concomitant to this in vitro measure was a depression in the concentration of circulating polyunsaturated fatty acid cholesterol esters. Since the plasma lecithin-cholesterol acyltransferase reaction has been shown to be dependent upon sulfhydryl groups on the enzyme, it is proposed that the observed reduction in esterification of cholesterol by plasma from vitamin E-deficient monkeys is due to alteration of these sulfhydryl sites. A similar reduction in the plasma lecithin-cholesterol acyltransferase reaction has been shown to occur during exposure in vivo to a pure oxygen atmosphere, a condition predisposing to lipid peroxidation. Author (GRA)

N74-22768# Westinghouse Electric Corp., Annapolis, Md. Ocean Research and Engineering Center.

EFFECT OF SUBSTITUTING HYDROGEN FOR HELIUM ON HUMAN THERMAL EXCHANGE IN HYPERBARIC ENVIRONMENTS Final Report, Jul. 1972 - Jan. 1974

N. Eugene Smith Jan. 1974 30 p refs
(Contract N00014-72-C-0545; NR Proj. 101-964)
(AD-774682) Avail: NTIS CSCL 06/19

The substitution of hydrogen for helium as an inert gas in hyperbaric environments was examined for its impact on human thermal exchange at depths between 10 and 100 atmospheres. Based on present data the theoretical ambient temperature required for thermal balance does not differ significantly between hydrogen-oxygen and helium-oxygen mixtures in a dry environment. A diver in cold water will experience a respiratory heat loss approximately one-third greater breathing hydrogen-oxygen, and his inspiration temperature must be adjusted accordingly. This investigation revealed a definite lack of experimental data on transport or thermophysical properties of gas mixtures involving helium and/or hydrogen at pressures to 100 atmospheres. Author (GRA)

N74-22769# Texas Univ., Austin. Electronics Research Center.

DETECTION OF REM, 1 SLEEP STAGE AND EYE MOVEMENT FROM BEAT-TO-BEAT HEART RATE

F. J. Weber, A. J. Welch, F. B. Vogt, and P. C. Richardson 6 Jun. 1973 61 p refs
(Contract F44620-71-C-0091; AF Proj. 4751)
(AD-775387; TR-150) Avail: NTIS CSCL 06/16

Interest in using sleep stage patterns to determine the amount and quality of a pilot or astronaut's sleep has led to a series of Air Force sponsored studies. The ultimate goal of these studies is to be able to determine sleep stage from beat-by-beat heart rate data alone (not using the EEG). Work performed at the University of Texas by Welch, et al, and Aldredge et al, has indicated that stage REM (rapid eye movement sleep) is refractory to detection by techniques which perform satisfactorily on the other sleep stages. In addition, the Welch algorithm performs more effectively when the times of occurrence of stage REM (or combined stages REM and 1) are already known. The purpose of this phase of study is to test the hypothesis that the occurrence of rapid eye movements can be detected by concurrent transient oscillations in the heart rate. A knowledge of REM occurrences would then greatly simplify recognition of the REM sleep stage. Alternatively, direct recognition of stage REM, 1 (stage REM and stage 1) sleep may be possible by spectral analysis of heart rate. Both possibilities are investigated. (Modified author abstract) GRA

N74-22770# Earth Satellite Corp., Washington, D.C.

AN ANALYSIS OF THE BENEFITS AND COSTS OF AN IMPROVED CROP ACREAGE FORECASTING SYSTEM UTILIZING EARTH RESOURCES SATELLITE OR AIRCRAFT INFORMATION

William Vogely 16 Nov. 1973 144 p refs
(Contract DI-14-08-001-13519)
(PB-227361/3; USGS-DO-74-002) Avail: NTIS HC$4.75 CSCL 02D

The broad area of agricultural production was selected for the first case study based on the magnitude of potential benefits and the results of early ERTS-1 experiments. Within the area of agricultural production the case study focused on crop acreage forecasting. Compared to the USDA statistical sampling system, one based on satellite imagery would have a substantially larger number of samples, would permit substitution of cloud covered samples, and would have daily update. In the absence of estimates of overall accuracy of ERS crop acreage estimates, benefits were estimated as a function of error over a range of improvements. Inventory adjustment benefit estimates were made using a previously developed model. Estimated benefits are expected to be more equally distributed across different regions and income classes than is current income. Minimal social and environmental impacts were identified. GRA

N74-23266* Kanner (Leo) Associates, Redwood City, Calif.

NEW EXPERIMENTAL CONTRIBUTIONS TO UNDERSTANDING THE EFFECT OF ULTRASONIC IRRADIATION ON TOMATOES

A. Elena *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 238-242 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 311-316 (For availability see N74-23226 14-23)

N74-23267* Kanner (Leo) Associates, Redwood City, Calif.

THE ACTION OF ULTRASOUNDS ON BEZOSTAIA 1 WINTER WHEAT GROWN IN SAND POTS TREATED WITH KNOP SOLUTION

N. Albu *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 244-249 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 319-324 (For availability see N74-23226 14-23)
CSCL 06H

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-22771* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PROGRAMMABLE PHYSIOLOGICAL INFUSION Patent

Wayne H. Howard, Donald R. Young, and Richard R. Adachi, inventors (to NASA) Issued 7 May 1974 7 p Filed 1 Dec. 1972 Supersedes N73-14092 (11 - 05, p 0503)
(NASA-Case-ARC-10447-1; US-Patent-3,809,871;
US-Patent-Appl-SN-311175; US-Patent-Class-235-151.3;
US-Patent-Class-128-214E) Avail: US Patent Office CSCL 06B

A programmable physiological infusion device and method are provided wherein a program source, such as a paper tape, is used to actuate an infusion pump in accordance with a desired program. The system is particularly applicable for dispensing calcium in a variety of waveforms.
Official Gazette of the U.S. Patent Office

N74-22772 Oklahoma State Univ., Stillwater.

THE COMPARATIVE EFFECTIVENESS OF A PROLONGED FLARE AND NORMAL FLARE ON STUDENT PILOT

ACHIEVEMENT IN THE LANDING MANEUVER AND ON TIME TO SOLO Ph.D. Thesis
Wayne Robert Matson 1973 81 p
Avail: Univ. Microfilms Order No. 74-8078

An experimental teaching strategy, employing a prolonged flare, was developed and its relative effectiveness was compared to a teaching strategy employing a normal flare. The study indicated that once a student had made his first acceptable landing, he could continue to land without assistance. Prolonged flare practice did not interfere with a student's ability to make normal flare landings. The two methods of flare were equally effective for the students learning how to land an airplane. The two methods of flare did not differentially affect student achievement in learning to solo an airplane. The study indicated that the two methods and the two environments did not interact in any significant way in any of the comparisons. Dissert. Abstr.

N74-22773*# Stanford Research Inst., Menlo Park, Calif.
STUDY TO DESIGN AND DEVELOP REMOTE MANIPULATOR SYSTEM Quarterly Report, 1 May - 1 Aug. 1973
J. W. Hill and A. J. Sword Aug. 1973 39 p refs
(Contract NAS2-7507; SRI Proj. 2583)
(NASA-CR-138237; QR-1) Avail: NTIS HC $5.00 CSCL 05H

Human performance measurement techniques for remote manipulation tasks and remote sensing techniques for manipulators are described for common manipulation tasks, performance is monitored by means of an on-line computer capable of measuring the joint angles of both master and slave arms as a function of time. The computer programs allow measurements of the operator's strategy and physical quantities such as task time and power consumed. The results are printed out after a test run to compare different experimental conditions. For tracking tasks, we describe a method of displaying errors in three dimensions and measuring the end-effector position in three dimensions. Author

N74-22774*# Virginia Univ., Charlottesville. Center for the Application of Science and Engineering to Public Affairs.
THE APPLICABILITY OF SPECIAL SUBJECT GROUPS FOR ASSESSING PASSENGER REACTION TO FLIGHT ENVIRONMENTS
Ira D. Jacobson and Ashok N. Rudrapatna Nov. 1973 24 p
(Grant NGR-47-005-181)
(NASA-CR-132433; Rept-403211) Avail: NTIS HC$4.25 CSCL 05E

The following conclusions were reached on passenger responses: (1) Within acceptable limits, the crew/flight attendants do not appear to be able to predict passenger responses. (2) There exists a relationship between passenger and subject overall responses. (3) Finally, a strong relationship exists between a suitably weighted running and overall subjective response. The recommended weighting function W(I) is approximately equal to I to the 0.75 power, indicating that the latter part of a flight is given more importance in a subject's overall comfort evaluation than the beginning of the flight. Author

N74-22775*# Kanner (Leo) Associates, Redwood City, Calif.
SUBJECTIVE AND OBJECTIVE EVALUATION OF MACHINERY NOISE
M. Jahn Washington NASA May 1974 29 p refs Transl. into ENGLISH from Acustica (West Germany), v. 16, no. 3, 1965-1966 p 175-186
(Contract NASw-2481)
(NASA-TT-F-15593) Avail: NTIS HC $4.50 CSCL 05E

Machinery noises were judged subjectively by 28 investigators and were combined with several methods of objective estimation. Conclusions were drawn about accuracy and reproduction of subjective aural comparisons. Testing of different calculation methods showed that for actual machinery noises, calculations of loudness from the third octave level leads to most accurate results. Author

N74-22776*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STUDY OF EXTRATERRESTRIAL DISPOSAL OF RADIOACTIVE WASTES. PART 1: SPACE TRANSPORTATION AND DESTINATION CONSIDERATIONS FOR EXTRATERRESTRIAL DISPOSAL OF RADIOACTIVE WASTES
R. L. Thompson, J. R. Ramler, and S. M. Stevenson Apr. 1974 64 p refs
(NASA-TM-X-71557; E-7982) Avail: NTIS HC $6.25 CSCL 18G

A feasibility study of extraterrestrial disposal of radioactive waste is reported. This report covers the initial work done on only one part of the NASA study, that evaluates and compares possible space destinations and space transportation systems. The currently planned space shuttle was found to be more cost effective than current expendable launch vehicles by about a factor of 2. The space shuttle requires a third stage to perform the waste disposal missions. Depending on the particular mission, this third stage could be either a reusable space tug or an expendable stage such as a Centaur. Author

N74-22777*# Techtran Corp., Glen Burnie, Md.
WHO SHOULD BE ENTRUSTED WITH AN INTERPLANETARY SPACECRAFT?
O. Borisov Washington NASA May 1974 8 p Transl. into ENGLISH from Kazakhstanskaya Pravda Newspaper, 3 Apr. 1974 p 4 and Medistinakaya Gazeta, 12 Apr. 1974 p 4
(Contract NASw-2485)
(NASA-TT-F-15644) Avail: NTIS HC $4.00 CSCL 05E

Psychological compatibility in an international crew is discussed. Although disagreements and clique formations are inevitable, they can be minimized by a scientific approach to group selection and, especially, selection of a commander. Selection should be based not only on professional qualifications, but also on the individual's ability to relate to others, and training should develop this ability. Previous experience in stress situations is very helpful. Good group relations are also aided by an awareness of differences within the group and by the process of overcoming physical hardships together. Author

N74-22778*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUMMER INSTITUTE IN BIOMEDICAL ENGINEERING, 1973 Final Report
Eugene M. DeLoatch Feb. 1974 117 p refs Prepared by Howard Univ.
(Grant NGT-09-011-051)
(NASA-TM-X-70639; X-207-74-103) Avail: NTIS HC $9.00 CSCL 06B

Design and development work is reported for an air filter, an infant weight scale, multiple electrode cardiography, a white noise hearing aid, and a tibial torsion correction device. For individual titles, see N74-22779 through N74-22784.

N74-22779* Massachusetts Inst. of Tech., Cambridge.
SURGICAL SUITE ENVIRONMENTAL CONTROL SYSTEM
Eve J. Higginbotham and Marc L. Jacobs (Lehigh Univ., Allentown, Pa.) *In* NASA. Goddard Space Flight Center Summer Inst. in Biomed. Eng., 1973 Feb. 1974 24 p refs (For availability see N74-22778 14-05)
CSCL 06B

Theoretical and experimental work for a systems analysis approach to the problem of surgical suit exhaust systems centered on evaluation of halothane absorbing filters. An activated charcoal-alumina-charcoal combination proved to be the best filter for eliminating halothane through multilayer absorption of gas molecules. G.G.

N74-22780* Wichita State Univ., Kans.
SURFACE POTENTIAL PROFILES
John K. Sharp and William P. Jones, Jr. (Purdue Univ.) *In* NASA. Goddard Space Flight Center Summer Inst. in Biomed. Eng., 1973 Feb. 1974 15 p (For availability see N74-22778 14-05)
CSCL 06B

The gathering of surface potential profiles by computerized processing of electrocardiogram data is projected. These profiles are concerned with the detail of localized potentials on the human body and are obtained by voltages plotted against electrode positions with time as the variable held constant. Sample and hold circuits are considered for processing the multiplexed signal and to digitize and code it for the tape recorder. G.G.

N74-22781* Cornell Univ., Ithaca, N.Y.
THE DESIGN OF A DEVICE FOR HEARER AND FEELER DIFFERENTIATION, PART A
Rodney Creecy *In* NASA. Goddard Space Flight Center Summer Inst. in Biomed. Eng., 1973 Feb. 1974 12 p refs (For availability see N74-22778 14-05)
CSCL 06B

A speech modulated white noise device is reported that gives the rhythmic characteristics of a speech signal for intelligible reception by deaf persons. The signal is composed of random amplitudes and frequencies as modulated by the speech envelope characteristics of rhythm and stress. Time intensity parameters of speech are conveyed through the vibro-tactile sensation stimuli. G.G.

N74-22782* Gallaudet Coll., Washington, D.C.
THE DESIGN OF AN EXPERIMENT FOR EMPLOYING THE HEARER-FEELER DIFFERENTIATION DEVICE, PART B
Ronald W. Betchtel *In* NASA. Goddard Space Flight Center Summer Inst. in Biomed. Eng., 1973 Feb. 1974 6 p refs (For availability see N74-22778 14-05)
CSCL 06B

An experimental test design is outlined to separate feelers from hearers in the evaluation of persons with varying degrees of hearing impairments. Speech envelope cues are derived from a white noise device containing filters for different frequencies that produce speech awareness thresholds. G.G.

N74-22783* Rose-Hulman Inst., Terra Haute, Ind.
DESIGN OF AN AUTOMATIC WEIGHT SCALE FOR AN ISOLETTE
Robert J. Peterka and William Griffin (National Technical Inst. for the Deaf) *In* NASA. Goddard Space Flight Center Summer Inst. in Biomed. Eng., 1973 Feb. 1974 15 p refs (For availability see N74-22778 14-05)
CSCL 06B

The design of an infant weight scale is reported that fits into an isolette without disturbing its controlled atmosphere. The scale platform uses strain gages to measure electronically deflections of cantilever beams positioned at its four corners. The weight of the infant is proportional to the sum of the output voltages produced by the gauges on each beam of the scale. G.G.

N74-22784* Pan American Univ., Edinburg, Tex.
INTERNAL TIBIAL TORSION CORRECTION STUDY
Juan M. Cantu and Coleen M. Madigan (Houston Univ.) *In* NASA. Goddard Space Flight Center Summer Inst. in Biomed. Eng., 1973 Feb. 1974 23 p refs (For availability see N74-22778 14-05)
CSCL 06B

A quantitative study of internal torsion in the entire tibial bone was performed by using strain gauges to measure the amount of deformation occuring at different locations. Comparison of strain measurements with physical dimensions of the bone produced the modulus of rigidity and its behavior under increased torque. Computerized analysis of the stress distribution shows that more strain occurs near the torqued ends of the bones where also most of the twisting and fracturing takes place. G.G.

N74-22785*# Scientific Translation Service, Santa Barbara, Calif.
THE EFFICIENCY OF LOCOMOTION
Erich Albert Mueller Washington NASA May 1974 14 p refs Transl. into ENGLISH from Arbeitsphysiologie (Berlin), v. 14, 1950 p 236-242
(Contract NASw-2483)
(NASA-TT-F-15600) Avail: NTIS HC $4.00 CSCL 05E

Efficiency in walking was measured by using a tow rope, or a descending slope, to balance energy requirement until the minimum energy was attained at 4 kg pulling force. Walking work was 0.065 mkg per meter of distance and per kilogram of body weight. The efficiency was 26-27%. Maximum efficiency was reached at 2 - 3 kg opposing force, where efficiency was 31%. Author

N74-22786# Joint Publications Research Service, Arlington, Va.
COSMONAUT FLIGHT PREPARATION
A. Nikolayev 24 May 1974 18 p Transl. into ENGLISH from Krylya Rodiny (Moscow), no. 2, Feb. 1974 p 10-14 and no. 3, Mar. 1974 p 10-13
(JPRS-62083) Avail: NTIS HC $4.00

Answers are given to questions concerning the training of cosmonauts for flights, content of the principle aspects of the program for their general, technical, special, and physical training, and about the design and layout of the Soyuz spacecraft. Author

N74-22787*# Techtran Corp., Glen Burnie, Md.
THE PARTIAL SIMULATION OF WEIGHTLESSNESS IN WATER
H. Vondiringshofen Washington NASA May 1974 9 p refs Transl. into ENGLISH from Zentral. Verkehrs-Med., Verkehrs-Psychol. Luft- und Raumfahrt-Med. (West Germany), v. 10, no. 4, Dec. 1964 p 193-197
(Contract NASw-2485)
(NASA-TT-F-15650) Avail: NTIS HC $4.00 CSCL 05E

Some balneology findings are shown to be of interest in space research. Various applications for the study of weightlessness are given. Author

N74-22788*# California Univ., La Jolla. Dept. of Radiology.
DEVELOPMENT AND INVESTIGATION OF SINGLE-SCAN TV RADIOGRAPHY FOR THE ACQUISITION OF DYNAMIC PHYSIOLOGIC DATA Semiannual Report, 1 Nov. 1973 - 30 Apr. 1974
Norman A. Baily 30 Apr. 1974 57 p refs
(Grant NGR-05-009-257)
(NASA-CR-138450) Avail: NTIS HC $6.00 CSCL 06R

Research data obtained by the low dose electronic radiography system are reported. Data cover: (1) localization and tracking of Ta screws implanted in the inner wall of the right ventrical of the heart, (2) use of cross hairs to outline inner or outer heart wall contours, (3) quantitative measure of anatomical components which are stationary in size or change size dynamically, and (4) study of dynamic quantitative data from roentenologic or fluoroscopic procedures. E.H.W.

N74-22789# Medical Physics Inst. Utrecht (Netherlands).
[ACTIVITIES OF RESEARCH GROUPS] Progress Report
Aug. 1972 194 p refs
(TNO-MFI-PR-3) Avail: NTIS HC $12.75

The activities of the Medical Physical Institute TNO during 1971-1972 are reported. They include the following areas: aids and appliances for the bodily handicapped, cardiovascular physics, brain research, ultrasound diagnostics, cybernetics, physiological signal processing, and promoting applications. ESRO

N74-22790# Human Resources Research Organization, Alexandria, Va.
UH-1 HELICOPTER MECHANIC (MOS 67N20) JOB DESCRIPTION SURVEY BACKGROUND, TRAINING, AND GENERAL MAINTENANCE ACTIVITIES
Russel E. Schulz, Barbara K. Fitzgerald, and Wallace W. Prophet Dec. 1973 203 p refs
(Contract DAHC19-73-C-0004; DA Proj. 2Q0-62107-A-745)
(AD-775390; HumRRO-TR-73-33) Avail: NTIS CSCL 05/9

The report describes the planning, conduct, analysis, and results of a worldwide survey of the maintenance activities of over 5,000 UH-1 helicopter mechanics, MOS 67N20. It describes methods and techniques used in developing the survey questionnaire and a job description inventory covering more than 1,400 helicopter maintenance tasks, administration of the survey by mail and by research teams in the field, and extraction and analysis of survey results. The report provides a broad profile of UH-1 maintenance personnel, their training and background, and a description of the UH-1 mechanic's general job activities. Data concerning performance of the 1,400+ maintenance tasks are presented in a companion report. Author (GRA)

N74-22791# Environmental Protection Agency, Washington, D.C. Environmental Research Center.
ALTERNATIVE FUTURES AND ENVIRONMENTAL QUAL-

ITY
Peter Barth, Murray Bowen, John Calhoun, Alexander Christakis, and Chester Cooper Nov. 1973 248 p refs
(PB-226052/9) Avail: NTIS HC $3.85 CSCL 13B

This book is divided into two parts. Part one, Challenges of Alternative Futures, reviews the environmental and population issues, presents a recent systems method of analyzing the problems of growth and summarizes the international implications of growth policy. Part two, Coping with Alternative Futures, presents human behavioral factors and their influence on growth policy. Classical and modern concepts of economics and implications of economics for growth policy conclude the work. Author (GRA)

N74-22792# Iowa Univ., Iowa City.
EFFECT OF TRAINING AND HEAT-ACCLIMATIZATION ON THE MECHANISMS OF TEMPERATURE REGULATION IN MAN Technical Report, 1 Jun. 1972 - 31 May 1973
Carl V. Gisolfi 25 May 1973 83 p refs
(Contract N00014-68-A-0196-0008; NR Proj. 101-812)
(AD-773962) Avail: NTIS CSCL 06/19

The objectives of the task order were to determine the effects of physical training in a cool environment on the tolerance of men for work in the heat, the effects of short-term heat-acclimation on the ability of men to perform prolonged work in the heat, and the effects of training and heat-acclimation on the sensitivity, rate, and distribution of sweat on the body surface and the distribution of blood in the lower limbs during leg exercise. Also included in this report is a comparison of mean skin temperature weighting formulas during different combinations of work loads and ambiant conditions as well as an evaluation of hyperthermic preventive techniques during prolonged severe exercise in the heat (33/21 C db/wb). (Modified author abstract) GRA

N74-22745 Joint Publications Research Service, Arlington, Va.
STUDY OF ORGANIZATION OF A FLIER'S ATTENTION DURING INSTRUMENT FLIGHT
I. D. Malinin and V. A. Ponomarenko *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 97-102 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 64-68 (For availability see N74-22732 14-04)
Avail: NTIS

N74-22747 Joint Publications Research Service, Arlington, Va.
PRINCIPLES IN FORMULATING OPTIMUM SLEEP AND WAKEFULNESS REGIMES FOR MAN DURING PROLONGED SPACE FLIGHTS
A. N. Litsov *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 108-114 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 71-75 (For availability see N74-22732 14-04)

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-22793 Florida Univ., Gainesville.
PROPERTIES OF LIQUID SODIUM AT HIGH TEMPERATURES Ph.D. Thesis
Hyun Joon Shin 1973 107 p
Avail: Univ. Microfilms Order No. 74-9564

A method for computing the radial distribution function of the nuclei and electrons in a fluid has been developed and tested on sodium at high temperatures at the density of liquid sodium just above its melting point. This procedure gives essentially exact results in the limit of infinite temperatures but encounters increasing difficulty as the temperature is lowered. The calculations are made with very crude approximations designed to uncover the difficulties that may be encountered in the more time-consuming procedures now under development using Monte Carlo techniques. Dissert. Abstr.

N74-22794 Syracuse Univ., N.Y.
THE STRONTIUM-MAGNESIUM PHASE SYSTEM Ph.D. Thesis
Joseph William Brown, Jr. 1973 107 p
Avail: Univ. Microfilms Order No. 74-8344

The strontium-magnesium equilibrium system was investigated using differential thermal analysis and X-ray diffraction methods over the entire composition range from 100 atomic percent magnesium to 100 atomic percent strontium. Pure strontium was prepared by vacuum distillation of the technical grade metal. The purified strontium exhibited a melting point of 772 C, however Sr having a melting point of 774 C was obtained and used throughout this investigation. This high quality strontium displayed allotropic phase transformation. Dissert. Abstr.

N74-22795 Wisconsin Univ., Madison.
THE ANALYSIS OF APOLLO 15 RAKE SAMPLE WALNUTS AND LUNAR BRECCIAS 15465, 3 AND 15565, 7 FOR MAJOR AND TRACE ELEMENTS BY ATOMIC ABSORPTION SPECTROPHOTOMETRY AND NEUTRON ACTIVATION ANALYSIS Ph.D. Thesis
Douglas Paul Blanchard 1973 124 p
Avail: Univ. Microfilms Order No. 74-473

An analysis for major elements by instrumental neutron activation and atomic absorption spectrophotometry for 10 mg samples of silicate rock is described. Portions of fourteen Apollo 15 rate sample walnuts were analyzed for the major elements Si, Al, Fe, Mg, Ca, K, Na, Ti, and Mn. One had a composition similar to KREEP basalts. The others were mare basalts. Three samples each from two Apollo 15 breccias were analyzed for major elements and Ba, Sr, Ni, Zn, Cr, Ga, Co, Sc, Hf, Cs, Rb, and 12 rare-earths.

N74-22796*# Stanford Research Inst., Menlo Park, Calif.
SYNTHESIS OF CALCIUM SUPEROXIDE Final Report
R. T. Rewick, W. G. Blucher, and P. L. Estacio Dec. 1972 26 p refs
(Contract NAS2-6954; SRI Proj. 1899)
(NASA-CR-138239) Avail: NTIS HC $4.50 CSCL 07D

Efforts to prepare Ca(O2) sub 2 from reactions of calcium compounds with 100% O3 and with O(D-1) atoms generated by photolysis of O3 at 2537 A are described. Samples of Ca(OH) sub 2, CaO, CaO2, Ca metal, and mixtures containing suspected impurities to promote reaction have been treated with excess O3 under static and flow conditions in the presence and absence of UV irradiation. Studies with KO2 suggest that the superoxide anion is stable to radiation at 2537 A but reacts with oxygen atoms generated by the photolysis of O3 to form KO3. Calcium superoxide is expected to behave in an analogous. Author

N74-22797*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
USE OF WHATMAN-41 FILTERS IN AIR QUALITY SAMPLING NETWORKS (WITH APPLICATIONS TO ELEMENTAL ANALYSIS)
Harold E. Neustadter, Steven M. Sidik, Robert B. King, J. Stuart Fordyce, and John C. Burr Washington May 1974 64 p refs
(NASA-TN-D-7595; E-7576) Avail: NTIS HC $3.75 CSCL 14B

The operation of a 16-site parallel high volume air sampling network with glass fiber filters on one unit and Whatman-41 filters on the other is reported. The network data and data from several other experiments indicate that (1) Sampler-to-sampler and filter-to-filter variabilities are small; (2) hygroscopic affinity of Whatman-41 filters need not introduce errors; and (3) suspended particulate samples from glass fiber filters averaged slightly, but not statistically significantly, higher than from Whatman-41-filters. The results obtained demonstrate the practicability of Whatman-41 filters for air quality monitoring and elemental analysis. Author

N74-22798*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATIVE VAPORIZATION KINETICS OF CHROMIUM (III) OXIDE IN OXYGEN FROM 1270 TO 1570 K
Carl A. Stearns, Fred J. Kohl, and George C. Fryburg Washington May 1974 25 p refs

(NASA-TN-D-7628; E-7788) Avail: NTIS HC $3.00 CSCL 07D

Rates of oxidative vaporization of Cr_2O_3 on preoxidized resistively heated chromium were determined in flowing oxygen at 0.115 torr for temperatures from 1270 to 1570 K. Reaction controlled rates were obtained from experimental rates by a gold calibration technique. These rates were shown to agree with those predicted by thermochemical analysis. The activation energy obtained for the oxidative vaporation reaction corresponded numerically with the thermochemical enthalpy of the reaction. A theoretical equation is given for calculating the rate from thermodynamic data by using boundary layer theory. Author

N74-22799# Advisory Group for Aerospace Research and Development, Paris (France).
GAS SAMPLING AND ANALYSIS IN COMBUSTION PHENOMENA [PRELEVEMENT ET ANALYSE DE GAZ DANS LES PHENOMENES DE COMBUSTION]
G. Lengelle (ONERA, Paris) and C. Verdier (ONERA, Paris) Jul. 1973 187 p refs In FRENCH
(AGARDograph-168(FR); AGARD-AG-168(FR)) Avail: NTIS HC $12.50

The application of gas analysis techniques to determine combustion efficiency in turbine engines and rocket engine combustion chambers is discussed. The fundamental data for combustion kinetics in a perfectly stirred reactor and in premixed laminar flames are reported. Various methods of gas analysis using gas phase chromatography, mass spectrometry, absorption of electromagnetic radiations, and physiochemical methods of flow-through analysis are explained. Author

N74-22800*# Scientific Translation Service, Santa Barbara, Calif.
GAS CHROMATOGRAPHIC DETERMINATION OF THE PRODUCTS OF DESTRUCTION OF POLYMER MATERIALS BY RADIATION STERILIZATION
V. A. Voblikova, V. I. Myshkovskiy, E. I. Semenko, and V. E. Vendillo Washington NASA May 1974 9 p refs Transl. into ENGLISH from Khim.-Farm. Zh. (USSR), v. 7, no. 8, 1973 p 56-58
(Contract NASw-2483)
(NASA-TT-F-15573) Avail: NTIS HC $4.00 CSCL 07D

A study is made of a method for determining the gaseous products of radiation destruction formed in the process of sterilization. The advantages of gas chromatography for this purpose are itemized. Author

N74-22801*# Kanner (Leo) Associates, Redwood City, Calif.
PRESENCE AND REGULATION OF THE SYNTHESIS OF TWO ALCOHOL DEHYDROGENASES FROM SACCHAROMYCES CEREVISIAE
L. Schimpfessel Washington NASA May 1974 21 p refs Transl. into ENGLISH from Biochim. Biophys. Acta (Amsterdam), v. 151, 1968 p 317-329
(Contract NASw-2481)
(NASA-TT-F-15647) Avail: NTIS HC $4.25 CSCL 07C

Saccharomyces cerevisiae is able to synthesize two different alcohol dehydrogenases according to the culture carbon substrate: the alcohol dehydrogenase 1 produced by the yeast grown on glucose is the fermentative alcohol dehydrogenase, and the alcohol 2 produced by the yeast growth on lactate or ethanol as a sole source of carbon and energy, is the oxidative alcohol dehydrogenase. The difference between the two enzymes is shown by the study of their thermostability and of their substrate specificity. These two enzymes require NAD as cofactor and have the same optimal pH. The alcohol dehydrogenase 2 is repressed by glucose. Author.

N74-22802*# Bishop Coll., Dallas, Tex.
RADIATION CHEMISTRY OF MONOMERS AND POLYMERS Final Report
J. E. Wilson [1973] 95 p refs
(Grant NGR-44-032-003)
(NASA-CR-138255) Avail: NTIS HC $7.75 CSCL 07C

Types and sources of radiation, radiation effects on matter, short term chemical effects of radiation absorption, and radiochemistry of small molecules are discussed. Radiolytic polymerization in homogeneous systems and in the solid state are described, along with radiation-induced polymerization in thermosetting, polyester, and emulsion systems. Crosslinking versus scission in irradiated polymers and radiolytic grafting of monomers on polymeric films are also considered. J.A.M.

N74-22803*# Wisconsin Univ., Madison.
THE POLARIZABILITY OF DIATOMIC HELIUM Ph.D. Thesis
Patrick John Fortune 26 Apr. 1974 184 p refs
(Grants NGL-50-002-001; NSF GP-28213)
(NASA-CR-138258; WIS-TCI-511) Avail: NTIS HC $12.25 CSCL 07D

The calculation of the electric dipole polarizability tensor of the He_2 dimer is described, and the results are used in the computation of several dielectric and optical properties of helium gas, at both high (322 K) and low (4 K) temperatures. The properties considered are the second dielectric virial coefficient, the second Kerr virial coefficient, and the depolarization ratio of the integrated intensities for the Raman scattering experiments. The thesis consists of five parts: the polarizability and various properties are defined; the calculation of the polarizability in the long-range region in terms of a quantum mechanical multipole expansion is described; the calculation of the He_2 polarizability in the overlap region via coupled Hartree-Fock perturbation theory is described; the calculation of the quantum pair distribution function for both the He-3 and He-4 isotopes at 4 K is discussed; and the calculated values of the properties of helium gas are given. Author

N74-22804*# Tennessee Univ., Knoxville. Molecular Spectroscopy Lab.
ELECTRIC FIELD INDUCED SPECTRA OF H sub 2 AND D sub 2 Ph.D. Thesis
William Joseph Boyd, III Jun. 1974 213 p refs
(Grant NGL-43-001-006)
(NASA-CR-138257) Avail: NTIS HC $13.75 CSCL 07D

The frequencies of four Q-branch lines of H_2 and five Q-branch lines of D_2 were measured as a function of density, and their shifts were observed to be in the linear region. The individual slopes and extrapolated zero density frequency of each line was determined. Hydrogen was measured for polarizability using the integrated intensity of the Q1(0) and S1(1), H_2 absorption line. A highly automated technique for determining the response function of the spectrometer using digitally recorded data is presented. For the Q1(0) and Q1(1) lines of H_2 the halfwidths were measured as a function of electric field intensity at constant pressure, and again at several densities and compared to previously measured widths. Technical and operational details of equipment built for this experiment, and for the five-meter Littrow spectrometer used, are described. Modifications of the spectrometer optics to accept the Stark cell are discussed. Author

N74-22805*# Rensselaer Polytechnic Inst., Troy, N.Y.
COMPOSITION DEPENDENT EFFECTS IN GAS CHROMATOGRAPHY
Raymond C. Lavoie May 1974 84 p refs
(Grant NGL-33-018-091)
(NASA-CR-138452; MP-41) Avail: NTIS HC $7.25 CSCL 07D

Fundamantal concepts are developed which are required to optimize a gas chromatograph-mass spectrometer chemical analysis system suitable for use on an unmanned roving vehicle for Mars exploration. Prior efforts have developed simulation models for the chromatograph which were compared with data obtained from a test facility. Representation of binary systems by superposition was shown to be a first-order approximation and in certain cases large discrepencies were noted. This subtask has as its objective generation of additional binary data and analysis of the observed nonlinear effects. Author

N74-22806# National Research Council of Canada, Ottawa (Ontario).
SOLUBILITY OF SPHALERITE IN AQUEOUS SOLUTIONS OF SODIUM CHLORIDE AT HIGH TEMPERATURES
V. V. Ivanenko and L. A. Pamfilova 1974 6 p ref Transl. into ENGLISH from the publ. "Trudy VIII Soveshchaniya po Eksperimentalnoi i Tekhicheskoi Mineralogii i Petrografii" Moscow,

Nauka, 1971 p 225-228
(NRC-TT-1735) Avail: NTIS HC $4.00

The effect of NaCl on the solubility of sphalerite in aqueous solutions saturated with hydrogen sulphide is examined. The equilibrium concentrations of sphalerite were determined directly in the ampoule at high temperatures. The experiments were conducted at 100 - 200 C. The solvents were sodium chloride solutions with concentrations of 2 and 4 moles/litre. The initial pH of solutions ranged from 0.3 to 8.3. The solutions were prepared from recrystallized NaCl (chemically pure) and were saturated with H2S at 25 C. The pH was measured prior to the experiments at room temperature. The solubility of sphalerite as a function of temperature changes with the acidity of the solution. Author

N74-22807# National Research Council of Canada, Ottawa (Ontario).

VIBRATIONAL SPECTRA OF HIGH POLYMER CHAINS

T. Miyazawa 1974 49 p refs Transl. into ENGLISH from Vippon Kagaku Zasshi (Tokyo), v. 88, no. 2, 1967 p 111-124
(NRC-TT-1737) Avail: NTIS HC $5.50

Vibrational spectra of straight molecular chains and the number of vibrations and phase differences of helical molecular chains are described. Vibrational spectra of the (-M-) sub N type molecular chains are discussed with the difference caused by steric structures. Theories and applications of G and B matrices are related to vibrations of general helical molecular chains. Methods of calculating frequencies of degenerate vibrations and types of such vibrations are described along with energy distribution and atomic displacement. Finally, theories and applications of degeneracies of helical molecular chains with a twofold axis of symmetry are discussed. Author

N74-22808# Allied Chemical Corp., Idaho Falls, Idaho. Chemical Programs Operations Office.

ANALYTICAL METHODS MANUAL. PART 1. METHODS USED BY THE REMOTE AND SERVICE ANALYSIS LABORATORY

J. M. Crawford, ed. Oct. 1973 588 p refs
(Contract AT(10-1)-1375)
(ICP-1029) Avail: NTIS HC $13.60

Research in spectroscopic chemical analysis is outlined. Methods used and results obtained for many different elements are presented. S.K.W.

N74-22809# National Physical Lab., Teddington (England). Div. of Chemical Standards.

THE VAPOUR PRESSURE OF WATER

D. Ambrose and I. J. Lawrenson Sep. 1973 17 p
(NPL-Chem-24) Avail: NTIS HC $4.00

An equation representing the variation of the vapor pressure of water with temperature is proposed and discussed. Vapor pressure values, calculated from the equation, are tabulated as a function of Kelvin and Celsius temperatures. A table of Celsius temperature as a function of the vapor pressure of water is given. ESRO

N74-22810# Institut Franco-Allemand de Recherches, St. Louis (France).

PHOTOCHEMICAL BEHAVIOR OF PRECIPITATED AgBr AEROSOL [PHOTOCHEMISCHES VERHALTEN VON NIEDERGESCHLAGENEM AgBr-AEROSOL]

H. Mach and Udo Werner 27 Apr. 1973 30 p refs In GERMAN
(ISL-13/73) Avail: NTIS HC $4.50

An AgBr aerosol was produced by an exploding silver wire in a bromide/argon atmosphere and precipitated on a quartz glass plate. Irradiation of the formed layer in the UV spectral range from 300 to 400 nm produced a blackening, which disappeared gradually after the radiation stopped (phototropism), if the layer was in contact with bromine vapor. The effect of laser light on the temporal characteristics of the remission of several layers was measured with varying irradiation intensity, bromine vapor density, and layer density. Increasing bromine content has a clearing effect. The measured blackening and regeneration times are about 10 times shorter than those of commercial orthotropic glasses. ESRO

N74-22811# Army Natick Labs., Mass. Mass Clothing and Personal Life Support Equipment Lab.

PREPARATION OF DIMETHYLSILYLENE-BISBENZOXAZOLES

John H. Cornell and David Remy Oct. 1973 25 p refs
(DA Proj. 1T0-62105-A-329)
(AD-774839; C/PLSEL-110; USA-NLABS-773-49-CE) Avail: NTIS CSCL 07/3

Organic derivatives and precursors of the novel bisbenzoxazole dimethylsilanes were prepared as model compounds for projected thermally stable polymers containing this moiety. 5,5)-Dimethylsilylenebis(2-phenylbenzoxazole) and the 2-methyl analog are very thermally stable. (Modified author abstract) GRA

N74-22812# Louisiana State Univ., Baton Rouge. Dept. of Chemistry.

DIRECT DETERMINATION OF METALS IN AIR Final Report, 1 Apr. 1970 - 31 1973

J. W. Robinson Aug. 1973 75 p refs
(Grant EPA-R-800866)
(PB-226774/8; EPA-650/2-73-011) Avail: NTIS HC $3.50 CSCL 07D

An instrument was developed capable of the direct determination of metals in air. No prior scrubbing or extracting of the metals from the air is necessary. Consequently, the time necessary for analysis is a matter of minutes - permitting real time analysis to be carried out on a small volume of air. The method was based on atomic absorption spectroscopy and involved the development of a highly efficient atomizer. The sensitivity of the method was determined to be about 10 to the minus 12th power grams. Procedures for the direct quantitative determination of lead, mercury or cadmium in the air were developed. Calibration techniques were studied and reliable analytical techniques were developed. (Modified author abstract) GRA

N74-22813# British Steel Corp., Sheffield (England). Information Services.

SECOND REPORT OF THE WORKING PARTY ON THE APPLICATION OF THE ATOMIC ABSORPTION SPECTROSCOPIC TECHNIQUE: COLLABORATIVE STUDY OF INTER-ELEMENT INTERFERENCE EFFECTS

P. H. Scholes Dec. 1973 22 p refs Supersedes CAC/82/73
(PB-227362/1; CDL/CAC/117/73; CAC/82/73) Avail: NTIS HC $4.25 CSCL 07D

Selected inter-element interferences in atomic absorption spectroscopy have been examined. Several types of interference have been illustrated, the influence of third elements and differences in effects experienced using both airacetylene and nitrous oxide-acetylene flames have also been considered. A wide variation in the degree of effect between laboratories was observed and it is evident that interference effects must be measured individually, using published work as a guide only. (Modified author abstract) GRA

N74-22737 Joint Publications Research Service, Arlington, Va.

EFFICIENCY IN USING THE PRODUCTS OF FORMALDEHYDE CONDENSATION IN THE SYNTHESIS OF CARBOHYDRATES

V. A. Uspenskaya and G. M. Petrova *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 20-24 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 20-24 (For availability see N74-22732 14-04)

N74-22738 Joint Publications Research Service, Arlington, Va.

SYNTHESIS OF METHYL ALCOHOL FROM CO2 AND H2 AS AN INTERMEDIATE PRODUCT OF CARBOHYDRATE PRODUCTION

M. G. Rozenfeld, M. T. Rusov, S. K. Sachenko, and Yu. Ye. Sinyak *In its* Space Biol. and Aerospace Med., Vol. 8, No. 2, 1974 (JPRS-62082) 24 May 1974 p 24-28 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 8, no. 2, Mar. - Apr. 1974 p 24-28 (For availability see N74-22732 14-04)

N74-23249* Kanner (Leo) Associates, Redwood City, Calif.

EFFECTS OF ULTRASONIC FIELDS IN THE PHOSPHORIC ACID PROCESS

E. Kowalska, J. Mizera, and H. Jakobiec *In its* The 4th Natl. Conf. on acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 148-152 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica, Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 187-191 (For availability see N74-23226 14-23)
CSCL 07D

N74-23250* Kanner (Leo) Associates, Redwood City, Calif.
ULTRASONIC FILTRATION OF INDUSTRIAL CHEMICAL SOLUTIONS
T. Cosma *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-156631) Apr. 1974 p 153-157 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 193-197 (For availability see N74-23226 14-23)
CSCL 07D

N74-23251* Kanner (Leo) Associates, Redwood City, Calif.
MOLECULAR COMPRESSIBILITY OF SOME HALIDES IN ALCOHOLS
C. Serban and D. Auslaender *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 158-161 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 199-203 (For availability see N74-23226 14-23)
CSCL 07C

N74-23253* Kanner (Leo) Associates, Redwood City, Calif.
CHECKING THE STATISTICAL THEORY OF LIQUIDS BY ULTRAACOUSTIC MEASUREMENTS
V. N. Dima *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 166-171 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 211-216 (For availability see N74-23226 14-23)
CSCL 07D

N74-23254* Kanner (Leo) Associates, Redwood City, Calif.
INTERNAL PRESSURES AND MOLECULAR DIMENSIONS IN AQUEOUS SOLUTIONS OF SOME CHLORIDES
D. Auslaender, I. Lenart, E. Rus, and A. Ciupe *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 172-176 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 219-224 (For availability see N74-23226 14-23)
CSCL 07D

N74-23256* Kanner (Leo) Associates, Redwood City, Calif.
ACOUSTIC PROPERTIES OF ORGANIC ACID MIXTURES IN WATER
I. Macavei, V. Petrisor, and D. Auslaender *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 183-188 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultransunete (Bucharest), 29-31 May 1973 p 233-238 (For availability see N74-23226 14-23)
CSCL 07D

N74-23257* Kanner (Leo) Associates, Redwood City, Calif.
ULTRASONIC VELOCITY AND ADIABATIC COMPRESSIBILITY IN DIOXANE-WATER MIXTURES
A. Ciupe and D. Auslaender *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 189-193 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 241-246 (For availability see N74-23226 14-23)
CSCL 07D

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-22814* National Aeronautics and Space Administration. Pasadena Office, Calif.
HIGH ISOLATION RF SIGNAL SELECTION SWITCHES Patent
Michael F. Hanna (JPL) and Harry K. Detweiler, inventors (to NASA) (JPL) Issued 30 Apr. 1974 6 p Filed 27 Mar. 1973 Supersedes N73-23106 (11 - 14, p 1618) Sponsored by NASA
(NASA-Case-NPO-13081-1; US-Patent-3,808,464; US-Patent-Appl-SN-345372; US-Patent-Class-307-243; US-Patent-Class-307-215; US-Patent-Class-307-290; US-Patent-Class-328-154) Avail: US Patent Office CSCL 17B

A selection switch with high isolation between RF signal input terminals is achieved with a gated Schmitt trigger circuit feeding into a control NAND gate in each signal switching channel. The control NAND gates of the separate signal channels are coupled to an output terminal by a single NAND gate. The schmitt trigger circuits and all gates are implemented with Schottky transistor-transistor logic circuits having input clamping diodes. Each Schmitt trigger circuit includes two cascaded NAND gates and a feedback isolation Schottky diode between one input terminal connected to receive an RF input and another input terminal connected to receive a feedback signal from the second of the two cascaded NAND gates. Both NAND gates of the Schmitt trigger circuits are enabled by the same switch control signal which enables the control gates.
Official Gazette of the U.S. Patent Office

N74-22815 Syracuse Univ., N.Y.
HIGH-DIMENSIONAL DISCRIMINANT ANALYSIS OF COMPLEX SAMPLED DATA RADAR SIGNALS Ph.D. Thesis
Peter H. Stockmann 1973 134 p
Avail: Univ. Microfilms Order No. 74-8365

A sequential regression classification method is presented which allows one to approximate a high dimensional discriminant function by a number of more readily attainable discriminant functions. The technique of high dimensional discriminant analysis of sampled data signals was applied to the problem of classifying aerospace targets on the basis of the radar signals which they reflect. An actual data base of complex sampled data radar signal was available for this purpose. Dissert. Abstr.

N74-22816 Wisconsin Univ., Madison.
ON DATA ANALYSIS OF A COMPUTERIZED RADAR SYSTEM Ph.D. Thesis
Parveen K. Gupta 1973 194 p
Avail: Univ. Microfilms Order No. 73-28325

A method for forward scatter radar data processing is developed which leads to automatic mapping of atmospheric layers and wind speeds. Until now layers and winds were deduced by subjective analysis of the scattering functions of the data. Here, pattern recognition techniques are employed to automate this process of finding layers and winds. The algorithm for automatic classification is tested for the June 1971 data and shown to be very efficient. Dissert. Abstr.

N74-22817 Akron Univ., Ohio.
PULSE COMPRESSION IN DISPERSIVE MEDIA Ph.D. Thesis
Apostolos Constantine Raptis 1973 143 p
Avail: Univ. Microfilms Order No. 74-9218

The dispersive properties of a plasma medium are used as a compression network to enhance transmitted pulses at the receiver. In particular, through the basic concept of group velocity, the phase of the incoming signal is matched with the characteristics of the plasma medium. Input signals are developed for lossless or lossy, isotropic bounded or unbounded, homogeneous plasmas. The problem is solved from the systems point of view, and frequency domain is used to obtain the enhanced output signals. To accomplish this, the fast fourier transform routine is used. The effects of the boundaries, for the bounded medium, in relation to the unbounded medium are explained with the aid of geometrical optics. Dissert. Abstr.

N74-22818 British Broadcasting Corp., Kingswood (England). Research Dept.

COMPARISON OF PICTURE IMPAIRMENTS CAUSED BY DIGITAL CODING OF PAL AND SECAM VIDEO SIGNALS
V. G. Devereux Apr. 1974 7 p refs
(BBC-RD-1974/16) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Subjective tests are described which were performed to compare the picture impairment caused by pulse-code modulation (p.c.m.) and differential pulse-code modulation (d.p.c.m.) of PAL ans SECAM 625-line video signals. For p.c.m. coding the results indicated that the minimum number of bits per sample required for broadcast quality pictures was the same for both color systems. For d.p.c.m. coding only one particular 5-bit coding law and one form of prediction was examined. This d.p.c.m. coder was originally intended to operate on PAL signals. The resulting impairments were almost imperceptible on most pictures for both PAL and SECAM signals, but for the most critical pictures, the impairment was noticeably greater for SECAM than from PAL. Author

N74-22819 British Broadcasting Corp., Kingswood (England). Research Dept.
THE m.f. AERIALS: THE DETERMINATION OF GROUND-WAVE c.m.f. AND MEAN GROUND CONDUCTIVITY FROM RADIAL FIELD MEASUREMENTS BY AN OPTIMISATION TECHNIQUE
J. L. Eaton Apr. 1974 7 p refs
(BBC-RD-1974/18) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A computing method for obtaining c.m.f. and average ground conductivity values from sets of ground-wave measurements taken on radials from an m.f. aerial should be valuable in assessing the performance of new arrays in the future. A suitable optimization technique which can be employed for this purpose and could be realized as a computer program is described. Author

N74-22820 British Broadcasting Corp., Kingswood (England). Research Dept.
THE GENERATION OF VIDEO SYNCHRONISING PULSES AND TEST WAVEFORMS BY DIGITAL SYNTHESIS: TIMING ERRORS CAUSED BY QUANTISING DISTORTION
P. A. Ratliff Apr. 1974 20 p refs
(BBC-RD-1974/17) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Digital waveform synthesis produces interval timing errors, or wave-shape distortion, when generation of transitions is required at intervals which are not integer multiples of the sampling clock period. A rule was evolved to determine the timing accuracy with which a digital system, with quantization limitations, is capable of generating waveform transitions. Synchronizing pulse edges and 2T pulses were generated at intervals of 1/16 of a clock-period, using a sampling clock-rate of thrice color subcarrier frequency. A synchronizing pulse jitter of less than +2.5 ns is obtainable, and tests on a video tape recorder indicate that this amount of jitter is satisfactory. Author

N74-22821 Ernst-Mach-Inst., Freiburg (West Germany).
PROPAGATION OF SPHERICAL WAVES IN LINEAR VISCO-ELASTIC MATERIAL [AUSBREITUNG VON SPHAERISCHEN WELLEN IN LINEAR-VISKO-ELASTISCHEN STOFFEN]
Dieter Coors Dec. 1973 51 p refs In GERMAN
(Rept-9/73) Avail: Issuing Activity

A material law for linear viscoelastic matter was derived, based on the Voigt and Maxwell models. The law contains material constants only. The propagation of spherical dilatational waves was treated using the abovementioned law. Agreement between theory and experiment was sought by varying the material constants, and was achieved for several values of the constants. Thus it is not possible to determine the material constants using experimental values. For the experimental values, data from Norconsult, Oslo, on the decrease of the tension maximum with increasing distance from the wave source, were used. ESRO

N74-22822*# Ohio State Univ., Columbus. ElectroScience Lab.
MILLIMETER WAVELENGTH PROPAGATION STUDIES Annual Status Report, Nov. 1972 - Oct. 1973
D. B. Hodge Oct. 1973 10 p refs
(Grant NGR-36-008-080)
(NASA-CR-139003; ESL-2374-17) Avail: NTIS HC $4.00 CSCL 20N

Diversity data obtained using the ATS-5 satellite and available BTL data were compared with optimum diversity gain predictions. This comparison indicates that terminal spacings exceeding 8 km result in values of diversity gain within 1.5 dB of the optimum. The thunderstorm cell modeling technique for predicting attenuation and diversity gain statistics was extended to include ellipsoidal cell models. A three rain gage method for the measurement of cell size, ellipticity, and orientation was developed. Author

N74-22823*# Illinois Univ., Urbana. Ionosphere Radio Lab.
WAVE PROPAGATION AND EARTH SATELLITE RADIO EMISSION STUDIES Final Report, 1 Jul. 1959 - 31 Dec. 1973
K. C. Yeh, C. H. Liu, and B. J. Flaherty Jan. 1974 111 p refs
(Grant NGR-14-005-002)
(NASA-CR-138238; TR-53; UILU-ENG-74-2540) Avail: NTIS HC $8.75 CSCL 20N

Radio propagation studies of the ionosphere using satellite radio beacons are described. The ionosphere is known as a dispersive, inhomogeneous, irregular and sometimes even nonlinear medium. After traversing through the ionosphere the radio signal bears signatures of these characteristics. A study of these signatures will be helpful in two areas: (1) It will assist in learning the behavior of the medium, in this case the ionosphere. (2) It will provide information of the kind of signal characteristics and statistics to be expected for communication and navigational satellite systems that use the similar geometry. Author

N74-22824*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PARABOLIC CYLINDER ANTENNAS
R. F. Schmidt Sep. 1973 59 p refs
(NASA-TM-X-70631; X-811-73-221) Avail: NTIS HC $6.00 CSCL 17B

Some of the features of single and dual parabolic-cylinder reflector antenna systems are discussed in terms of wave conversions, field divergence, and wavefronts in Fresnel and Fraunhofer regions. Beam-squinting, by mechanical displacement and electrical phase gradient methods, is introduced together with the combination of these methods. In the case of dual parabolic cylinders there is also a discussion of surface-truncation, parametric representation of surface intersections, main-aperture blockage by the subsystem, and beam squinting. A few diffraction patterns are presented to illustrate the type of data available via a formulation equivalent to the complex-vector Kirchhoff-Kottler formulation. Main and cross-polarization components of the solution are available as they are inherently part of the field solution in the Cartesian coordinate system. A means of displaying main and cross-polarization components for arbitrary beam-scanning in space is outlined. Extensions to monopulse tracking with variable-beamwidth (zooming) capability are introduced. Author

N74-22825*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE THEORY OF LARGE AMPLITUDE ALFVEN WAVES
M. L. Goldstein, A. J. Klimas, and F. D. Barish Apr. 1974 8 p refs Submitted for publication
(NASA-TM-X-70640; X-692-74-106) Avail: NTIS HC $4.00 CSCL 20N

Large amplitude Alfvenic disturbances of arbitrary spatial shape and polarization are described by MHD equations, without resort to the usual assumption of planarity. However, because of their nonplanar nature, the direction of propagation of these disturbances cannot, in general, be determined by looking for minima in a variance matrix constructed from observed field fluctuations. When such minima exist, one is observing that subset of interplanetary Alfven waves that is essentially planar. Author

N74-22826# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
A NEW METHOD FOR DIRECTION FINDING OF ELLIPTI-

CALLY POLARIZED VLF WAVES
Koichiro Tsuruda and Kanji Hayashi Mar. 1974 20 p refs
(ISAS-509-Vol-39-No-6) Avail: NTIS HC $4.00

A method was developed for the direction finding of elliptically polarized VLF electromagnetic waves. The method uses simple algebraic relations between the vertical electric fields and the horizontal magnetic field of the incident wave to eliminate the TE component of the magnetic field. The present method can give a reasonably accurate estimate of the angle of incidence as well as azimuth when the incident wave is elliptically polarized. This is complementary to the classical goniometer technique which is suited for the direction finding of the linearly polarized waves. Preliminary experimental result on the direction finding of whistlers by this technique is also reported. Author

N74-22827*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POLARIZATION COMPENSATOR FOR OPTICAL COMMUNICATIONS Patent Application
Michael W. Fitzmaurice and James B. Abshire, inventors (to NASA) Filed 24 Apr. 1974 23 p
(NASA-Case-GSC-11782-1; US-Patent-Appl-SN-463925) Avail: NTIS HC $4.25 CSCL 17B

An optical data communication system is reported whereby two orthogonal polarization states of a light beam carrier correspond to digital states. In such a system, automatic polarization compensation is provided by applying a dither modulating voltage to a cell exhibiting the electrooptic effect. The cell controls the relative phase of electric field components of an input light beam enabling the dither frequency component of the difference of the instantaneous powers in the two polarization states to be coherently detected. A signal derived from the coherent detection process is fed back to the cell via an integrator to form a polarization bias compensating, servo loop. NASA

N74-22828# National Weather Service, Silver Spring, Md.
INTRODUCTION TO WEATHER RADAR
Mar. 1974 81 p
Avail: NTIS HC $7.25

A study guide for the use of radar information by weather station personnel is presented. Topics discussed include: fundamentals of the equipment, propagation and detection, measurements and reports, and echo intensities. F.O.S.

N74-22829# National Environmental Satellite Service, Suitland, Md.
A METHOD OF CONVERTING THE SMS/GOES WEFAX FREQUENCY (1691 MHz) TO THE EXISTING APT/WEFAX FREQUENCY (137 MHz)
John J. Nagle Apr. 1974 22 p refs
(NOAA-TM-NESS-54) Avail: NTIS HC $4.25

The modifications required to convert the 1691.0-MHz signal from the SMS/GOES satellite to the 137-MHz frequency used by current satellites are described so that existing receiving and facsimile equipment can be used to the maximum possible extent. System parameters are discussed in sufficient detail for designing equipment. Theoretical calculations were verified by test transmissions of WEFAX photographs at various signal levels, which are included. Author

N74-22830# International Geophysical Year World Data Center A, Boulder, Colo.
SYNOPTIC RADIO MAPS OF THE SUN AT 3.3 mm FOR THE YEARS 1967-1969
Earle B. Mayfield, Kennon P. White, III, and Fred I. Shimabukuro Environmental Data Service Apr. 1974 30 p refs Sponsored by NOAA
(UAG-32) Avail: NTIS MF $1.45; National Climatic Center, Federal Building, Asheville, N.C. 28801. Attn: Publications HC $0.35

For the results reported here, the antenna was programmed to obtain a matrix of emission temperatures centered on the solar disk. A 19x19 matrix was obtained by rastering the antenna between adjacent points. Four seconds settle time was allowed between readings and one second integration for temperature measurement. These individual values were normalized to an undisturbed region near the center of the disk to eliminate the requirement for absolute calibration of the data. This reference temperature used for normalization was selected by analysis of observation previously obtained of the mm radio emission together with the Fraunhofer Institut maps to select a quiet region free of plage or other disturbed emission. One limitation of the maps is that beyond 0.7 R (normalized solar radius) the interpretation becomes difficult because of the finite beam width of the antenna at the solar limb. As a result, the isotherms are restricted to regions less than 0.7 R. Occasional pointing errors and occasional variations in cloud cover occur. Author

N74-22831*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
ORDINARY ELECTROMAGNETIC MODE INSTABILITY
Chio Zong Cheng May 1974 46 p refs
(Grant NGL-16-001-043)
(NASA-CR-138451; U-of-Iowa-74-19) Avail: NTIS HC $5.50 CSCL 20N

The instability of the ordinary electromagnetic mode propagating perpendicular to an external magnetic field is studied for a single-species plasma with ring velocity distribution. The marginal instability boundaries for both the purely growing mode and the propagating growing modes are calculated from the instability criteria. The dispersion characteristics for various sets of plasma parameters are also given. The typical growth rates are of the order of the cyclotron frequency. Author

N74-22832# Heinrich-Hertz-Institute fuer Schwingungsforschung, Berlin (West Germany).
DATA TRANSMISSION WITH ORTHOGONAL MODULATION AND MULTIPLE AMPLITUDE STEPS IN TELEPHONE CHANNELS [DATENUEBERTRAGUNG MIT ORTHOGONALER MODULATION UND VIERFACH AMPLITUDENSTUFUNG AUF FERNSPRECHKANAELEN]
Horst Spitzer and Hany Selim 20 Nov. 1973 59 p refs In GERMAN
(Rept-162) Avail: NTIS HC $6.00

A modem allowing an approximation of maximum signaling speed within the bandwidth limit of the channel is described. The orthogonal modulation principle with four amplitude steps was selected. Problems in coherence demodulation and channel equalization were treated. The conditions for synchronization were investigated in the special case of transmission over random telephone channels. The results of a series of measurements carried out on a channel simulation, and a transmission line, loop (Berlin-Frankfurt-Berlin), are indicated. The latter measurement points out a mean error rate in relation to strong daytime variations. ESRO

N74-22833# Heinrich-Hertz-Institute fuer Schwingungsforschung, Berlin (West Germany).
OPTIMAL QUANTIZATION OF LAPLACE SOURCES WITHOUT MEMORY [OPTIMALE QUANTISIERUNG GEDAECHTNISFREIER LAPLACEQUELLEN]
Peter Noll and Rainer Zelinski 22 Aug. 1973 24 p refs In GERMAN
(Rept-166) Avail: NTIS HC $4.25

A general optimization law for memoryless Laplace sources was investigated, leading to a class of optimal quantizers. These quantizers are defined by the rule that for each output entropy the mean quadratic error is minimal. Important known special cases of these quantizer classes are the quantizer for absolute lowest mean quadratic error and the quantizer for maximum transinformation. Linear as well as nonlinear quantizer characteristics were investigated. The results, which are compared to the rate distortion function of memoryless Laplace sources, are of importance to a series of speech coding methods (PCM, DPCM and ADPCM), as speech signals, or their difference signals (for prediction coding) approximate a Laplace distribution. ESRO

N74-22834# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Electronique 2.
PORTABLE TERMINAL FOR DATA ACQUISITION USING A CASSETTE RECORDER [TERMINAL PORTABLE DE SAISIE DE DONNEES UTILISANT UN ENREGISTREUR A CASSETTE]
Jean Feton, Michel Naveaux, and Yves Sagot 1973 89 p In FRENCH

Avail: NTIS HC $7.50

The implementation of a portable terminal for management system data acquisition using an audio cassette recorder and audio coupler for computer dial up is presented. Various subsystems are detailed with regard to keyboard, visualization, cassette motor, acoustic coupler, buffer memory, modem, bit synchronization, and power supplies. Various problems are dicsussed with regard to the reception circuit of the audio coupler, the synchronization of the series-parallel conversion, the rotation variation of the cassette motor, and the address counter optimization. An economic analysis is dealt with and estimates of the overall costs are given.
ESRO

N74-22835# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
ON THE IDENTIFICATION OF CONTINUOUS LINEAR PROCESSES
A. J. Breimer Jan. 1974 97 p refs
(TH-74-E-43; ISBN-90-6144-043-2) Avail: NTIS HC $8.00

The estimation of parameters of continuous, linear and time invariant processes is studied. It is assumed that the signals entering these processes are band limited. Sample values of the input and the disturbed output of the process are available. Two approaches are discussed: the use of a discrete time model of the continuous process and the more direct methods based on the derivatives or the spectra of the signals. The properties of this discrete time model were emphasized. For the more direct approaches, estimation schemes are developed, based on the instrumental variable technique. Experimental results of simulated and practical continuous processes are discussed.
Author (ESRO)

N74-22836# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
A SIMPLE METHOD OF SIMULATING MOTION AND PLASMA INDUCED VARIATIONS IN THE ATTENUATION OF SIGNALS TRANSMITTED FROM REENTRY VEHICLES Instrumentation Papers
J. L. Poirier and D. H. Tropea 17 Oct. 1973 26 p refs
(AF Proj. 4642)
(AD-775741; AFCRL-IP-204; AFCRL-TR-73-0650) Avail: NTIS CSCL 17/2

A simple method of simulating the variation in the amplitude of microwave signals from rocket-borne transmitters is presented. The technique reproduces signal changes caused by vehicle motion as well as those induced by plasma effects. The simulator uses a voltage controlled attenuator which is programmed to vary the output power of a test transmitter to produce the variations in signal amplitude which would be observed during a flight. An analog system which is suitable for variations of simple cyclical shape and a digital simulator which can reproduce changes of any complexity are presented. Use of the simulator before flight allows the dynamic behavior of a microwave link to be determined, permits optimum receiver and recorder parameters to be selected, increases operator confidence, and enhances flight test reliability.
Author (GRA)

N74-22837# Army Aviation Systems Test Activity, Edwards AFB, Calif.
EVALUATION OF THE TELEDYNE RYAN MODEL 622 TERRAIN-FOLLOWING RADAR SYSTEM INSTALLED ON OH-58A HELICOPTER Final Report, 6 Apr. - 15 Aug. 1973
Carl F. Mittag Nov. 1973 55 p refs
(AD-775806; USAASTA-73-02) Avail: NTIS CSCL 17/9

The objectives of the evaluation were to generate data to substantiate a terrain following radar (TFR) safety-of-flight release for further operational testing and to determine to what extent the TFR system aids the pilot during low-level flying. GRA

N74-22838# Owens Valley Radio Observatory, Pasadena, Calif.
SCINTILLATION AND APPARENT ANGULAR DIAMETER
M. H. Cohen and W. M. Cronyn (NOAA, Boulder, Colo.) 1974 19 p refs
(Contract N00014-67-A-0094-0019; Grants NSF GP-30400-X1; NSF GP-19400)
(AD-776282; Rept-1974-1) Avail: NTIS CSCL 03/2

Angular scattering, intensity scintillations, and apparent diameter are discussed in the context of arbitrary irregularity structure. The intrinsic diameter of a source can always be measured with an interferometer in the presence of arbitrarily strong scattering unless all three of the following conditions apply: (1) intrinsic diameter - scattering angle, (2) the source displays weak or no intensity scintillations, (3) a point source shows strong intensity scintillations. If these conditions do apply the apparent diameter is the scattering angle.
Author (GRA)

N74-22839# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE CHARACTERIZATION AND DISCRIMINATION OF EXOATMOSPHERIC OBJECTS THROUGH MULTIVARIATE EMPIRICAL ANALYSIS Final Report
D. C. Collins and W. S. Meisel 28 Dec. 1973 173 p refs
Prepared in Cooperation with Technol. Serv. Corp., Santa Monica, Calif.
(Contract F19628-73-C-0002; DA Proj. 7X2-63304-D-215)
(AD-775728; ESD-TR-74-42) Avail: NTIS CSCL 17/9

The objectives of the effort were to investigate implications of data on 1000 radar signatures as to (a) the level of discrimination of signatures of the target class (reentry vehicles) from signatures of the non-target class (other objects), and (b) to indicate the empirically derived decision rules and features of the signatures best for that purpose. The guiding philosophy was to develop an estimate of the best level of discrimination performance inherently possible, given the characteristics of the physical objects as evinced in the signatures, with minimal dependence on the physical model or on subjective inspection of the data. Methods used were the empirical analysis of multivariate data and, in particular, state-of-the-art pattern recognition techniques for feature creation, feature ranking, and discrimination algorithm development. (Modified author abstract) GRA

N74-22840# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
NON-LINEAR TRACKING IN A MULTI-TARGET ENVIRONMENT Technical Report, 1 Jun. - 1 Dec. 1973
Joseph M. LaGrotta, Daniel L. Alspach, and Louis L. Scharf 26 Feb. 1974 43 p refs
(Contract N00014-67-A-0299-0019)
(AD-775875; TR-4) Avail: NTIS CSCL 17/9

The combined problems of estimation, tracking, and prediction in a multi-target, multi-sensor environment are considered in the thesis. Using the previously devleoped Gaussian Sums approach to filtering, an inherently parallel algorithm is developed which provides information on target type and trajectory, as well as predictions of impact point. The algorithm, due to its parallel nature, shows great promise for real-time analysis of data from numerous sensors and targets. (Modified author abstract) GRA

N74-22841# Oklahoma State Univ. Research Foundation, Stillwater. Research Foundation Electronics Lab.
MOBILE S-BAND TRAJECTORY DETERMINATION AND TELEMETRY RECEIVING SYSTEMS
R. Michael Fike Nov. 1973 25 p refs
(Contract F19628-72-C-0139; AF Proj. 7659)
(AD-775748; Scientific-2; AFCRL-TR-73-0716) Avail: NTIS CSCL 09/6

A relatively inexpensive system has been developed for obtaining both trajectory and telemetry data (Tratel system) from sounding rockets launched at remote sites where radar sets and telemetry trackers are not available. Telemetry data and azimuth and elevation data are obtained using a Scientific-Atlanta tracking pedestal. Slant range is obtained using a Pseudo-noise (PN) ranging system developed by Motorola, Inc., as part of their Advanced Meteorological Sounding System (AMSS). An X, Y, Z trajectory is derived from the azimuth - elevation angles and a slant range. The AMSS ranging system was tested on two rockets and another rocket was used to test both telemetry reception and trajectory determination of the Tratel I system. These tests show excellent results for the PN ranging system and the Tratel I system.
Author (GRA)

N74-22842# Oklahoma State Univ. Research Foundation, Stillwater. Research Foundation Electronics Lab.
A SYNCHRONIZING CIRCUIT FOR PAM DECOMMUTA-

TION
Claude M. Gwinn Oct. 1973 16 p refs
(Contract F19628-72-C-0139; AF Proj. 7659)
(AD-775747; Scientific-1; AFCRL-TR-73-0715) Avail: NTIS CSCL 09/6

The circuits described in this report were designed and constructed to improve an existing system for decoding pulse amplitude modulated (PAM) commutation. The design of a frame sync detector and a sample aperture generator which are adjusted automatically by a phase-locked loop clock to accommodate any standard IRIG PAM format is covered. (Modified author abstract) GRA

N74-22843# Michigan Univ., Ann Arbor. Space Physics Research Lab.
IONOSPHERIC ANTENNA STUDY Final Report, 1 Jan. - 31 Dec. 1973
Herschel Weil 28 Feb. 1974 59 p refs
(Contract N00014-67-A-0181-0045)
(AD-776295; UMICH-010758-1-F) Avail: NTIS CSCL 09/5

The report summarizes work concerning the generation of VLF and ULF signals on board satellites moving through the earth's ionosphere. For signal generation by an electric dipole antenna theoretical and numerical work is described which aims at determining the near fields and effective antenna impedance without resorting to a priori assumptions about the antenna currents or the structure of a sheath and wake region. The radiation of power by pulse injection of charged particles into the ambient ionosphere is analyzed. (Modified author abstract) GRA

N74-22844# Illinois Univ., Urbana. Radio Research Lab.
BIBLIOGRAPHY OF REPORTS, JANUARY 1964 THROUGH FEBRUARY 1974
Edward W. Ernst Feb. 1974 27 p refs
(Contract N00014-67-A-0305-0002)
(AD-776256; UILU-ENG-74-2541; RRL-Pub-445) Avail: NTIS CSCL 17/3

The bibliography lists, by RRL reference number, reports which were prepared from January 1964 to February 1974 by the Radio Research Laboratory, Department of Electrical Engineering, University of Illinois, Urbana, Illinois. The list combines the bibliographies reported in RRL 333 and 376 and up-dates the listing to February 1974. Most of these reports were intended for limited distribution, so additional copies of most of the reports are not presently available. (Modified author abstract) GRA

N74-22845# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
LONG RANGE SURVIVABLE MF RADIO COMMUNICATION STUDY USING HIGH ALTITUDE WHISPERING GALLERY MODES
John I. Videberg and Gary S. Sales 28 Aug. 1973 60 p refs
(AD-775989; AFCRL-TR-73-0552; AFCRL-PSRP-561) Avail: NTIS CSCL 17/2

A study was undertaken to investigate the existence and properties of waves guided under the D-layer in low-loss Whispering Gallery or earth-detached modes at MF to LF. These low-loss paths are the result of focusing of rays reflected below the curved ionosphere, together with a marked decrease in ionospheric reflection loss at the highly oblique incidence angles obtainable only from high altitudes. Theory and calculations indicated an enhancement of this phenomenon during ionospheric disturbances and suggested a feasibility test. A low-power transmission experiment lasting over 30 hrs was successfully conducted between balloons separated by 1000 miles at an altitude of 35 km on 220 and 440 kHz. Signals were received on the balloon path over most of the day and night. Total path attenuations varied from 3 to 30 db below free space. Maximum signal height gains ranging from 40 to 60 db relative to an equivalent ground-to-ground path were measured. (Modified author abstract) GRA

N74-22846# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
UHF AND MICROWAVE FREQUENCY ACOUSTIC SURFACE WAVE DELAY LINES: DESIGN Physical Sciences Research Papers
Andrew J. Slobodnik, Jr. 16 Aug. 1973 92 p refs
(AF Proj. 5635)
(AD-775984; AFCRL-TR-73-0538; AFCRL-PSRP-559) Avail: NTIS CSCL 09/5

Small, lightweight, reliable, low cost acoustic surface wave delay lines are particularly useful in a variety of military applications including electronic sensing and communications. The purpose of the report is to provide detailed comprehensive procedures and theories for the optimum design of UHF and microwave frequency acoustic surface wave delay lines consisting of two identical, periodic, uniform width, interdigital transducers. The circuit model used to characterize device performance as a function of frequency includes a lossy tuning inductor, finite resistivity transducer fingers, and parasitic shunt capacitance. Surface wave propagation loss is also included. (Modified author abstract) GRA

N74-23516 European Space Research Organization, Paris (France).
ASYMPTOTIC EXPANSION METHOD FOR DETERMINING THE FIELD REFLECTED BY A RANDOM SURFACE
George Elias (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 62-96 refs
Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 81-98 (For availability see N74-23512 14-34)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-22847 Rutgers Univ., New Brunswick, N.J.
A CLASS OF REAL-TIME VIRTUAL MEMORY SYSTEM: A MULTI-FACETED APPROACH TO COMPUTER SYSTEM DESIGN Ph.D. Thesis
Philip Avery Johnson 1973 207 p
Avail: Univ. Microfilms Order No. 74-8792

A design philosophy for a class of real-time virtual memory computer systems is presented. The system studied is the class of multiprogrammed, virtual memory systems processing user-real-time requests. User-real-time processing in this context means that mean response time for a user request must be within a predetermined limit; if this limit is exceeded, economic and other penalties are imposed on the user. The material consists of four main parts: availability, paging strategies, queuing from the operating system viewpoint, and queuing from the user's viewpoint. It is intended to provide the system designer with both an overall plan for system design and new tools to aid in the process. Dissert. Abstr.

N74-22848 Wisconsin Univ., Madison.
THEORY AND DESIGN OF PRECISION DIGITAL INTEGRATORS USING LINEAR MULTISTEP INTEGRATION METHODS Ph.D. Thesis
Allen Leonard Larson 1973 270 p
Avail: Univ. Microfilms Order No. 73-28332

The consideration of the theory and design of precision digital integrators was motivated by a particular potential application - digital computers designed specifically to solve differential equations. A possible structure for such a computer, called a Dynamic Digital Computer (DDC), is proposed. A key element in such a computer is a piece of digital hardware called a Precision Digital Integrator (PDI). The problem considered in this work is the formation of integration algorithms and design considerations for the PDI's. An initial investigation was made to determine the feasibility of the DDC concept and the hardware PDI construction. The second phase of study was an investigation of means to formulate integration methods for use in PDI's. The third phase of study was examination of the trade-offs involved in PDI design. A standardized structure was used, permitting cost comparisons. Computer programs relating to the design and simulation are discussed. Dissert. Abstr.

N74-22849 Wisconsin Univ., Madison.
CONTROL SYSTEMS AND PART EDGE PROGRAMMING FOR COMPUTER NUMERICAL CONTROL Ph.D. Thesis
Aun Neow Poo 1973 540 p
Avail: Univ. Microfilms Order No. 73-32139

The low-cost minicomputer has made possible inexpensive, yet powerful and highly versatile, computer numerical control (CNC) systems. The alternative schemes and techniques involved in the design of CNC systems are described, along with the development and implementation of four CNC systems; including both open-loop and closed-loop controls. In each of the CNC systems, a point-to-point numerical control (NC) machine tool system, the Giddings and Lewis 10V NumeriCenter, was modified and placed under the control of a 12-bit minicomputer, a PDP8/E, with 4K of core memory. The control systems used hydraulic servo-drives with digital shaft encoders as position feedback transducers. Each of the four alternative CNC systems implemented used the part edge program, a part of programming language developed based on the capabilities of the minicomputer. Dissert. Abstr.

N74-22850 British Broadcasting Corp., Kingswood (England). Research Dept.
POPULATION COUNTS USING A COMPUTER DATA BANK
R. E. Davies Apr. 1974 10 p ref
(BBC-RD-1974/14) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A system of programs is described which enables population counts to be made within areas in the U.K. Contours are drawn on maps or map overlays. The data is drawn from a population data bank. Author

N74-22851*# Bolt, Beranek, and Newman, Inc., Arlington, Va.
ROBOT COMPUTER PROBLEM SOLVING SYSTEM Quarterly Progress Report, 23 Oct. 1973 - 23 Jan. 1974
Joseph D. Becker and E. William Merriam 23 Jan. 1974 49 p refs
(Contract NASw-2572)
(NASA-CR-138395; AI-10; BBN-2792) Avail: NTIS HC $5.50 CSCL 09B

The conceptual, experimental, and practical phases of developing a robot computer problem solving system are outlined. Robot intelligence, conversion of the programming language SAIL to run under the THNEX monitor, and the use of the network to run several cooperating jobs at different sites are discussed. E.H.W.

N74-22852# Lockheed Missiles and Space Co., Palo Alto, Calif.
PATTERN RECOGNITION USING AN OPTICO-ELECTRONIC ANALYZER
V. A. Maslov, V. A. Stuit, and A. V. Timofeev 27 Jan. 1970 5 p refs Transl. into ENGLISH from Vyohisl. Tekhn. i Voprosy Kibernetiki, (Leningrad), no. 8, 1971 p 148-153
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616 CSCL 09B

A system of pattern recognition is reported that uses electro-optical methods of spatial filtration to obtain the two dimensional Fourier transform for the pattern. An optical correlator is then used for reading printed pages. Results are presented of recognizing six word commands by means of speech videograms, of speakers by videograms of their speech, and of photographs of the TU-134 and Il-18 aircraft. Author

N74-22853# Lockheed Missiles and Space Co., Palo Alto, Calif.
ON AN ALGORITHM FOR RECOGNITION OF BINARY CODES
V. M. Smirnov [1972] 4 p refs Transl. into ENGLISH from Inzhen.-Matem. Metody v Fiz. i Kibernet., MIFI, Atomizdat, 1971 p 93-96
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

The problem is dealt with of seeking the description of some object in a library of descriptions. The desired search system would, upon presentation of a binary code, yield the address of the description in the storage or indicate that the description corresponding to the code was not in the library. An algorithm was developed which permits the execution of such a search in two matchings, on the average, for an arbitrarily large number of descriptions. D.L.G.

N74-22854*# Techtran Corp., Glen Burnie, Md.
PROCESSING OF INFORMATION IN ORGANISMS: PATTERN RECOGNITION, CONCEPTUALIZATION AND PROBLEM SOLVING
E. A. Faraponova Washington NASA May 1974 6 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), no. 6, Nov. - Dec. 1973 p 181-182
(NASw-2485)
(NASA-TT-F-15507) Avail: NTIS HC $4.00 CSCL 09B

The proceedings are given of the international symposium on information conversion in organisms. The papers presented included discussions on the theoretical, informational, and psychological modelling of thought and decision making processes. The concept of thought as a problem solving action was stressed and human thought processes were compared with those of computers. D.L.G.

N74-22855# Florida Univ., Gainesville. Dept. of Industrial and Systems Engineering.
EXPERIMENTS BY HYBRID COMPUTER SIMULATION FOR FORECASTING. THE EFFECTS OF PARAMETER CHANGES WITHIN COMPLEX STOCHASTIC PROCESSES Ph.D. Thesis - Helsinki Univ. of Technol.
P. E. Valisalo 1973 39 p refs
Avail: NTIS HC $5.00

The application of hybrid computers to the problem of forecasting in industries is discussed. Hybrid computation and stochastic system simulation techniques are shown for a number of cases. Eight methods are recommended and discussed for working with a hybrid system: stationary systems, covariance method, correlation methods, data fitting method, Fourier analysis, exponential smoothing, adaptive exponential smoothig, and a method to find the imbedded true signal within a noisy data. Also included is a method for how to generate 'noise' which will meet some predetermined requirements for forecasting purposes, along with a method for adaptive smoothing. K.M.M.

N74-22856*# Wisconsin Univ., Madison. Space Science and Engineering Center.
MAN-COMPUTER INACTIVE DATA ACCESS SYSTEM (MCIDAS) Final Report, 25 Jul. 1972 - 24 Jul. 1973
18 Aug. 1973 240 p
(Contract NAS5-21794)
(NASA-CR-139010) Avail: NTIS HC $15.00 CSCL 09B

A technical description is given of the effort to design, develop, fabricate, and test the two dimensional data processing system, McIDAS. The system has three basic sections: an access and data archive section, a control section, and a display section. Areas reported include hardware, system software, and applications software. K.M.M.

N74-22857*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPUTER GRAPHICS DISPLAY AND DATA COMPRESSION TECHNIQUE
Michael J. Teague (PMI Facilities Management Corp.), Howard G. Meyer (PMI Facilities Management Corp.), and Leon Levenson, ed. May 1974 90 p refs
(NASA-TM-X-69905; NSSDC-74-07) Avail: NTIS HC $7.50 CSCL 09B

The computer program discussed is intended for the graphical presentation of a general dependent variable X that is a function of two independent variables, U and V. The required input to the program is the variation of the dependent variable with one of the independent variables for various fixed values of the other. The computer program is named CRP, and the output is provided by the SD 4060 plotter. Program CRP is an extremely flexible program that offers the user a wide variety of options. The dependent variable may be presented in either a linear or a logarithmic manner. Automatic centering of the plot is provided in the ordinate direction, and the abscissa is scaled automatically for a logarithmic plot. A description of the carpet plot technique is given along with the coordinates system used in the program.

Various aspects of the program logic are discussed and detailed documentation of the data card format is presented. Author

N74-22858# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
FAST AND MODULAR ON-LINE DATA PROCESSING SYSTEM
R. Biancastelli 10 May 1973 14 p In ITALIAN; ENGLISH summary
(ISS-T-73/4) Avail: NTIS HC $4.00

In the framework of the studies for the Super Adone project, a modular system is proposed which is able to carry out simple on-line parallel data processing by standard integrated circuits techniques. The modularity permits the construction of systems by means of programming techniques instead of electronic engineering. For this purpose, a set of standard modules is needed for carrying out the same elementary operations accomplished by the instructions of a computer. In this way, a sequence of modules correspond to a computer program. Author

N74-22859# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
ANALOG AND DIGITAL COMPUTERS, PART 2
C. Bosio Dec. 1972 62 p In ITALIAN; ENGLISH summary
(ISS-72/20) Avail: NTIS HC $6.25

Digital computers, and systems of numbers are described along with analog to digital and digital to analog converters. Author

N74-22860# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Electronique 1.
MAINTENANCE OF INFORMATICS SYSTEMS: DECODER-ENCODER FOR MAGNETIC TAPE UNITS [MAINTENANCE DE SYSTEMES INFORMATIQUES: DECONDEUR-CODEUR POUR UNITES DE BANDES MAGNETIQUES]
Roland Barrot and Philippe Wallet 1973 64 p In FRENCH
Avail: NTIS HC $6.25

A coupler-decoder for analysis and memorization of read/write errors on a 1600 bpi magnetic tape is presented. The device was conceived with a view to compatibility with CII standard equipment. Errors or equipment failures are analyzed and grouped into four main categories, and the signals to be memorized are discussed according to their nature: instructions, errors, or phases. Implementation of the principles underlying the structure of the device was carried out using standard CII boards, and details of special functions required are given. The technology, the economical study, and the reliability of the device are discussed. ESRO

N74-22861# Maryland Univ., College Park. Computer Science Center.
A SURVEY OF EDGE DETECTION TECHNIQUES
Larry S. Davis Nov. 1973 60 p refs
(Grant NSF GJ-32258X)
(PB-226166/7; NSF-OCA-GJ32258X-24; TR-273) Avail: NTIS HC $5.00 CSCL 09B

Methods of detecting edges, i.e., boundaries between regions in a picture, are reviewed. Included are both parallel (linear, nonlinear, optimal) and sequential methods, as well as methods using planning or a priori knowledge. Author (GRA)

N74-22862# Maryland Univ., College Park. Computer Sciences Center.
EDGE FOLLOWING IN NOISY PICTURES
Gordon J. Vanderburg Oct. 1973 39 p refs
(Grant NSF GJ-32258)
(PB-226149/3; NSF-OCA-GJ33358X-22; TR-270) Avail: NTIS HC $4.00 CSCL 09B

Existing approaches to sequential detection of edges and curves in a noisy picture are reviewed, including methods involving state-space search and dynamic programming. Possible extensions and modifications to these methods are discussed. A procedural approach is recommended as more appropriate. Author (GRA)

N74-22863# Mitre Corp., Bedford, Mass.
REMOTE-TERMINAL EMULATOR (DESIGN VERIFICATION MODEL). VOLUME 7: DATA REDUCTION PROGRAM
M. C. Sarajian Jan. 1974 130 p refs
(Contract F19628-73-C-0001; AF Proj. 572Q)
(AD-775143; MTR-2677-Vol-7; ESD-TR-355-Vol-7) Avail: NTIS CSCL 09/2

A Design Verification Model (DVM) of a Remote-Terminal Emulator which measures the performance of multiterminal computer systems has been developed on a Data General Corporation NOVA 800 minicomputer system. The DVM real-time system software is supported by several non-real-time processors. This volume describes the design, implementation, and usage of the Data Reduction program (DATAR) used to process log tape data gathered during an emulator test run. The program produces general statistics, a histogram of percent of responses, and a variety of listings. Author (GRA)

N74-23015 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
DFVLR MOBILE RAKETENBASIS SOFTWARE CAPABILITY FOR SOUNDING ROCKETS
H. Bader *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 277-290 refs (For availability see N74-22980 14-13)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-22864* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOAD INSENSITIVE ELECTRICAL DEVICE Patent
Francisc C. Schwarz, inventor (to NASA) Issued 30 Apr. 1974 15 p Filed 6 Nov. 1970 Supersedes N72-21251 (10 - 12, p 1587) Continuation-in-part of US Patent Appl. SN-810579, filed 26 Mar. 1969
(NASA-Case-XER-11046-2; US-Patent-3,808,511;
US-Patent-Appl-SN-87597; US-Patent-Class-321-45R;
US-Patent-Appl-SN-810579) Avail: US Patent Office CSCL 09A

A class of power converters is described for supplying direct current at one voltage from a source at another voltage. It includes a simple passive circuit arrangement of solid-state switches, inductors, and capacitors by which the output voltage of the converter tends to remain constant in spite of changes in load. The switches are sensitive to the current flowing in the circuit and are employed to permit the charging of capacitance devices in accordance with the load requirements. Because solid-state switches (such as SCR's) may be used with relatively high voltage and because of the inherent efficiency of the invention that permits relatively high switching frequencies, power supplies built in accordance with the invention, together with their associated cabling, can be substantially lighter in weight for a given output power level and efficiency of operation than systems of the prior art. Official Gazette of the U.S. Patent Office

N74-22865* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEANS FOR ACCOMMODATING LARGE OVERSTRAIN IN LEAD WIRES Patent
Carl V. Rumble (Modern Machine and Tool Co.) and Kendall L. Driscoll, inventors (to NASA) (Modern Machine and Tool Co.) Issued 7 May 1974 4 p Filed 25 Apr. 1973 Supersedes N73-22151 (11 - 13, p 1499) Sponsored by NASA
(NASA-Case-LAR-10168-1; US-Patent-3,809,800;
US-Patent-Appl-SN-354407; US-Patent-Class-174-70R;
US-Patent-Class-174-69; US-Patent-Class-174-DIG.8;
US-Patent-Class-244-151R) Avail: US Patent Office CSCL 09A

An electrical wire is reported along whose length loops are formed at intervals and retained in a plastic capsule that allows unfolding of the loop when tension is exerted on the opposite ends of the wire. The capsule is formed by encompassing each loop with a sleeve of heat shrinkable synthetic plastic material which overlaps the loop and heat shrinking the overlapping portions. Thus, a length of electrical wire is formed which stores extra lengths of wire in the quantity needed to match the expected stretching of materials or elements such as ropes, cords and the like of high elongation to which the electrical wire may be attached. Official Gazette of the U.S. Patent Office

N74-22866 Saskatchewan Univ., Saskatoon.
SUBOPTIMAL ADAPTIVE CONTROL TO STABILIZE POWER SYSTEMS Ph.D. Thesis
Frank L. Stromotich 1973 155 p
Avail: Univ. Microfilms Order No. 74-9527

Research work is described which was done to improve generating unit speed oscillation damping using a combination of dynamic system state estimation and particular aspects of modern optimal and adaptive control. The conventional approaches to damping enhancement are reviewed and the need for alternative techniques is given. The pertinent aspects of modern control theory as related to this specific problem are reviewed and using these, a technique is presented for the design and implementation of a suboptimal adaptive controller for generator speed and oscillation damping enhancement. The results of several digital simulation studies of systems are given to illustrate the design techniques and to illustrate the type of performance that would be possible to achieve. In summary, the results are encouraging and it is recommended that further work be done to implement these methods in laboratory and field situations. Dissert. Abstr.

N74-22867 Florida Univ., Gainesville.
INVESTIGATION OF DEEP LEVEL IMPURITIES (OXYGEN AND CHROMIUM) IN BULK GALLIUM ARSENIDE AND Au-GaAs SCHOTTKY DIODES Ph.D. Thesis
Chern I. Huang 1973 87 p
Avail: Univ. Microfilms Order No. 74-9601

The roles that the deep level impurities, chromium and oxygen, play in the recombination and trapping processes of the photo-injected carriers in bulk n-type GaAs were investigated by using photomagnetoelectric (PME) and photoconductive (PC) effects at various injection ranges and temperatures. A generalized theory for the PME and PC effects is developed, taking into account the variation of carrier lifetimes with injected carrier density and the trapping of holes in the chromium levels, by using a Shockley-Read type recombination and trapping model. The experimental results have yielded the dependence of the carrier lifetimes on injections over a wide injection range in the Cr-doped GaAs. For the oxygen-doped n-type GaAs, it is found that at low temperatures the band to band radiative recombination mechanism prevails. The experimentally obtained capture probability compares favorably with Hall's radiative recombination model. Dissert. Abstr.

N74-22868+ Grenoble Univ. (France). Lab. d'Electrostatique.
FUNDAMENTALS OF HIGH EMITTIVITY LIQUIDS. LIQUID/CONDUCTOR AND LIQUID/INSULATOR INTERFACE PHENOMENA. APPLICATION TO CONDENSERS, ELECTROOPTICS, AND IONIC PUMPS Final Report [ETUDES FONDAMENTALES SUR LES LIQUIDES DE GRANDE PERMITTIVITE. PHENOMENES D'INTERFACE LIQUIDE/CONDUCTEUR ET LIQUIDE/ISOLANT. APPLICATION AUX CONDENSATEURS, A L'ELECTROOPTIQUE ET AUX POMPES IONIQUES]
N. J. Felici May 1973 46 p In FRENCH; ENGLISH summary
(Contract DGRST-69-01-582)
Avail: NTIS HC $5.50

Highly polar liquids like nitrobenzene and propylene carbonate were deionized, and the conditions for good resistivity were determined. Deionized liquids were tested in lapped insulation such as that encountered in paper or polypropylene capacitors and in Kerr cells. Electrical performance is fair to good. Analysis of losses with a modified D.L.A shows that the behavior of ions is very different at liquid/paper and liquid/polypropylene interfaces. In the first case, the Garton effect is observed, while in the second case the ions penetrate deeply into the polymer under the pull of an ac field; electroosmosis and deionization of the liquid are observed. Author (ESRO)

N74-22869*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-EFFICIENCY, LOW-TEMPERATURE CESIUM DIODES WITH LANTHANUM-HEXABORIDE ELECTRODES
James F. Morris May 1974 19 p refs Presented at Conf. on Plasma Sci., Knoxville, Tenn., 15-17 May 1974; sponsored by the Inst. of Elec. and Electron. Engr.
(NASA-TM-X-71549; E-7957) Avail: NTIS HC $4.00 CSCL 09A

Lanthanum hexaboride electrodes in 1700 K cesium diodes may triple power outputs compared with those demonstrated for nuclear thermionic space applications. Still greater relative gains seem possible for emitters below 1700 K. Further improvements in cesium diode performance should result from the lower collector temperatures allowed for earth and low power space duties. Decreased temperatures will lessen thermal transport losses that attend thermionic conversion mechanisms. Such advantages will add to those from collector Carnot and electrode effects. If plasma ignition difficulties impede diode temperature reductions, recycling small fractions of the output power could provide ionization. So high efficiency, low temperature cesium diodes with lanthanum hexaboride electrodes appear feasible. Author

N74-22870*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF MAGNETIC REFOCUSING IN LINEAR-BEAM MICROWAVE TUBES
N. Stankiewicz Washington May 1974 31 p refs
(NASA-TN-D-7660; E-7826) Avail: NTIS HC $3.25 CSCL 09A

Magnetic field configurations in which the axial component of the field decays linearly to a constant plateau field are evaluated for use in refocusing the output beam of linear beam microwave tubes. The slope of the decay and the value of the plateau field are parameters in this study. A uniform beam with a space charge force only in the radial direction is assumed, and the electron trajectories are computed for various classes. For a given magnetic configuration (slope and plateau value) the plateau length is calculated for a specified class and the rms deviation of the output angles for all classes is computed at the end of this plateau length. A minimum condition for a refocused beam is defined to be one in which the rms value of the output angles is less than the rms input. Many of the configurations satisfied this criteria and successfully reduced the rms value by half. Author

N74-22871*# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
NONCOHERENT DETECTION OF PERIODIC SIGNALS Interim Technical Report
Robert M. Gagliardi Apr. 1974 19 p refs
(Grant NGR-05-018-104)
(NASA-CR-138396; USCEE-471) Avail: NTIS HC $4.00 CSCL 09E

The optimal Bayes detector for a general periodic waveform having uniform delay and additive white Gaussian noise is examined. It is shown that the detector is much more complex than that for the well known cases of pure sine waves (i.e. classical noncoherent detection) and narrowband signals. An interpretation of the optimal processing is presented, and several implementations are discussed. The results have application to the noncoherent detection of optical square waves. Author

N74-22872*# California Univ., Berkeley. Space Sciences Lab.
THE STUDY OF ELECTRICAL CONDUCTION MECHANISMS Final Report, 1 Feb. 1973 - 31 Jan. 1974
H. F. Morrison 18 Apr. 1974 34 p refs
(Grant NGR-05-003-512)
(NASA-CR-138386; SSL-Ser-15-Issue-19) Avail: NTIS HC $4.75 CSCL 09C

The dielectric response of lunar fines 74241,2 is presented in the audio-frequency range and under lunarlike conditions. Results suggest that volatiles are released during storage and transport of the lunar sample. Apparently, subsequent absorption of volatiles on the sample surface alter its dielectric response. The assumed volatile influence disappear after evacuation. A comparison of the dielectric properties of lunar and terrestrial materials as a function of density, temperature, and frequency indicates that if the lunar simulator analyzed were completely devoid of atmospheric moisture it would present dielectric losses smaller than those of the lunar sample. It is concluded that density prevails over temperature as the controlling factor of dielectric permittivity in the lunar regolith and that dielectric losses vary slowly with depth. Author

N74-22873*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH VOLTAGE DISTRIBUTOR Patent Application
James F. McChesney, Jr., inventor (to NASA) Filed 15 May 1974 10 p
(NASA-Case-GSC-11849-1; US-Patent-Appl-SN-470428) Avail: NTIS HC $4.00 CSCL 09A

A high voltage distributor is described which allows the connection and disconnection of a high voltage power supply to and from one or more circuits requiring the supply. The design configuration features unrestrained pump-out, insulation of the high voltage from ground, and freedom from corona. These features are obtained by mounting a removable retaining rod on one or more insulators, thereby facilitating the support by retaining rod of a plurality of washers. One of the washers is integrally connected to the high voltage power supply while the remaining washers are integrally connected to the circuits requiring the high voltage. NASA

N74-22874*# Ohio State Univ., Columbus. ElectroScience Lab.
EDGE DIFFRACTED CAUSTIC FIELDS
W. D. Burnside and L. Peters, Jr. Washington NASA May 1974 30 p refs
(Grant NGL-36-008-138)
(NASA-CR-2400; ESL-2902-13) Avail: NTIS HC $3.25 CSCL 17B

The fields near a caustic created by an edge diffraction process are computed using the equivalent current concept. These fields are shown to have the property commonly associated with ray optical analysis or the Geometrical Theory of Diffraction (GTD), e.g., a 90 deg phase shift as the ray passes through the caustic. The present effort is directed toward consideration of the caustic created by an edge diffraction process. Particular attention is focused on electromagnetic excitation. The acoustic excitation for the hard boundary condition is outlined in an appendix. In addition, goal is to establish the extent of the caustic region. This is of particular importance when a ray optical solution involves multiply-diffracted terms in that the minimum size of the body that can be analyzed may be restricted by the extent of the caustic, i.e., the 90 deg phase shift used in ray optical analysis may be introduced only if the caustic is contained on the surface being studied. Author

N74-22875# National Aerospace Lab., Tokyo (Japan).
STUDY OF A RADIAL-EXITING HYSTERESIS GYRO MOTOR
Hiroshi Yamada Nov. 1973 11 p refs In JAPANESE; ENGLISH summary
(NAL-TR-340) Avail: NTIS HC $4.00

Conventional hysteresis motors have small ratios of the output power to the motor volume as compared with conventional induction motors, because the hysteresis materials have small hysteresis loops. A new rotor structure is proposed in which anisotropic magnetic material Alnico 5 is utilized, which has a large hysteresis loop. The proposed hysteresis motor has a large ratio of the output power to the motor volume and large starting torque as compared with conventional hysteresis motors. The principle, the structure, the voltage characteristics and the equivalent circuit of the proposed motor are presented. The comparison of the theoretical and experimental values of the slip-torque characteristics is also given. Author

N74-22876# General Electric Co., Pittsfield, Mass. Ordnance Systems.
ELECTRICAL CHARACTERIZATION OF COMPLEX MICROCIRCUITS Final Technical Report, Jun. 1972 - Jun. 1973
David A. Citrin Jan. 1974 379 p refs
(Contract F30602-72-C-0474; AF Proj. 5519)
(AD-775740; RADC-TR-73-373) Avail: NTIS CSCL 09/1

The objective of this study has been to develop guidelines for the electrical characterization and testing of microcircuits of varying degrees of complexity and to aid in assuring conformance to their detailed specification. The 4000 series of CMOS circuits, 9500 and 10,000 series of ECL circuits, Schottky (T squared)L circuits, and a Phase Locked Loop were electrically characterized according to their dc, switching and functional characteristics. Vendor comparisons, specification guidelines, test circuits and design rules are included for each family where applicable. Studies in sufficient detail were performed to form the basis for the generation of MIL-M-38510 slash sheets for interchangeable parts for military use. A comprehensive electrical and functional evaluation of a semiconductor memory fabricated using the Isoplanar process was performed. (Modified author abstract) GRA

N74-22877# Ohio State Univ., Columbus. ElectroScience Lab.
ELECTRICALLY SMALL ANTENNAS
C. H. Walter and E. H. Newman Feb. 1974 130 p refs
(Contract DAAG39-72-C-0041; HDL Proj. 117215)
(AD-775855; ESL-3281-3; HDL-TR-041-1) Avail: NTIS CSCL 09/5

Basic types of small antennas are described and figures of merit for small antennas are reviewed. Recent developments are discussed including active antennas, superconducting antennas and methods for analyzing small antennas. One of the analysis methods, the moment method, is used to generate design data for some practical small antennas for use at the tip of a projectile. Author (GRA)

N74-22878# International Business Machines Corp., Hopewell Junction, N.Y. Fishkill Lab.
DAMAGE PROFILES IN SILICON AND THEIR IMPACT ON DEVICE RELIABILITY Technical Report, 6 Jun. 1972 - 30 Dec. 1973
Guenter H. Schwuttke 1 Jan. 1974 68 p refs
(Contract DAHC15-72-C-0274; ARPA Order 2196)
(AD-775843; TR-3) Avail: NTIS CSCL 09/1

It is the purpose of this report to substantiate the previously reported findings on saw damage in silicon wafer surfaces and their dependency on the slicing technique. The measurements reported here concentrate on measurements of damage depth in as-sliced silicon wafers, on saw damage measurements in wafers, on saw damage measurements in wafers sliced horizontally (H-wafers) compared to wafers sliced vertically (V-Wafers), and, finally, on the measurement of fracture strength of silicon crystals and on the seed to tail variation of fracture strength in such crystals. GRA

N74-22879# Radiation, Inc., Melbourne, Fla.
SUBMARINE ANTENNA PEDESTAL SATELLITE COMMUNICATIONS Final Report
1974 110 p refs
(Contract N00014-73-C-0446)
(AD-775779) Avail: NTIS CSCL 09/5

The report details the approach to and efforts expended on the design, analysis and manufacturing of a miniature antenna pedestal, including the servo system and control unit. During the development period, the system and each subsystem were submitted to tests and analysis chosen to conform to the goals established for this program. Summation and analysis of the design and test results confirmed that all technical goals were successfully attained. Author (GRA)

N74-22880# Gautney and Jones Communications, Inc., Falls Church, Va.
EXPEDIENT AM AND FM BROADCAST ANTENNAS Final Report
Donald E. Pauley Nov. 1973 124 p refs
(Contract DAHC20-73-C-0160)
(AD-775831; G/J-TR-73.0160-73.0001) Avail: NTIS CSCL 09/5

The objective of this study is to select techniques and desirable equipment that will enable broadcasting stations in the Defense Civil Preparedness Agency Radio Broadcast Protection Program to rapidly restore broadcasting capability in the event of destruction of the regular antenna system. Expedient antennas are proposed for AM and FM stations and procurement specifications are presented. A monograph on the construction of expedient antennas from available materials is included. (Modified author abstract) GRA

N74-22881# Rockwell International Corp., Anaheim, Calif. Electronics Research Div.
PROGRAMMABLE ACOUSTIC SIGNAL PROCESSING DEVICES Interim Report, 1 Mar. - 1 Sep. 1973
P. J. Hagon, K. Milakim, and R. H. Seymour Feb. 1974 57 p
(Contract DAAB07-73-C-0106)
(AD-775844; C73-369.1/501; ECOM-0106-1) Avail: NTIS CSCL 09/1

The objective of this program is to develop advanced programmable signal processing devices which employ surface acoustic wave tapped delay lines and integrated control circuits. The effort includes the design, fabrication and evaluation of an electronically programmable waveform generator and matched filter for > or = 100 chip biphase coded spread spectrum waveform at a frequency of 435 MHz with a 20 MHz chip rate. The initial design tasks on both the surface acoustic wave tapped delay line and the microelectronic integrated control circuits have been completed and the results are detailed in the following sections. Photomask design and fabrication for the final devices are underway. Author (GRA)

N74-22882# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THEORY OF THE SYNTHESIS OF ANTENNAS
B. M. Minkovich and V. P. Yakovlev Feb. 1974 432 p refs
Transl. into ENGLISH of the book "Teoriya Sinteza Antenn" Moscow, Sovetskoye radio, 1969 296 p
(AF Proj. 5635)
(AD-776004; AFCRL-TR-74-0101) Avail: NTIS CSCL 09/5

The report contains synthesis techniques for all types of antennas. Subject matter covers the aperture field and the radiation pattern, mean-square approximation of an assigned pattern, the Chebyshev approximation, synthesis techniques for circular apertures, linear arrays, maximum gain, patterns with minimum sidelobes, and antenna processing techniques. (Modified author abstract) GRA

N74-22883# Harry Diamond Labs., Washington, D.C.
AN INTEGRATED HIGH-IMPEDANCE PREAMPLIFIER
Bernard J. Rod and Bohdan J. Dobriansky Oct. 1973 24 p refs
(DA Proj. 1W2-62301-A-300; HDL Proj. A20392)
(AD-775792; HDL-TM-73-25) Avail: NTIS CSCL 09/5

It is shown that an integrated circuit designed for a buried layer process can be made without a buried layer. Circuit and process details are given, together with experimental results. The circuit is an amplifier with a gain of 10 and an input impedance of 50 kiloohms. Performance is independent of temperature over a range from -40 to 80C with a satisfactory yield. Author (GRA)

N74-22884# Collins Radio Co., Cedar Rapids, Iowa.
TRANSCEIVER MULTICOUPLER Final Report, 15 Nov. 1972 - 24 Jan. 1974
Harvey L. Landt Mar. 1974 57 p
(Contract DAAB07-72-C-0179)
(AD-775845; ECOM-0179-F; Rept-523-0765337-00111M) Avail: NTIS CSCL 09/5

The report covers the development, construction, and test of two exploratory developmental models of the transceiver multicoupler. Improvements necessary to the design to achieve a manually tuned multicoupler suitable for field use are also presented. An automatically tuned version of the multicoupler is discussed. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-22885* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LOW DISTORTION AUTOMATIC PHASE CONTROL CIRCUIT Patent
Geir Hauge (Martin Marietta Corp., Denver) and Christ W. Pederson, inventors (to NASA) (Martin Marietta Corp., Denver) Issued 30 Apr. 1974 5 p Filed 5 Feb. 1973 Supersedes N73-17211 (11 - 08, p 0891) Sponsored by NASA
(NASA-Case-MFS-21671-1; US-Patent-3,808,517; US-Patent-Appl-SN-329958; US-Patent-Class-323-106; US-Patent-Class-323-122; US-Patent-Class-323-128) Avail: US Patent Office CSCL 09E

A voltage controlled phase shifter is rendered substantially harmonic distortion free over a large dynamic input range by employing two oppositely poled, equally biased varactor diodes as the voltage controlled elements which adjust the phase shift. Control voltages which affect the bias of both diodes equally are used to adjust the phase shift without increasing distortion. A feedback stabilized phase shifter is rendered substantially frequency independent by employing a phase detector to control the phase shift of the voltage controlled phase shifter. Official Gazette of the U.S. Patent Office

N74-22886 State Univ. of New York, Stony Brook.
ADAPTIVE GAIN CONTROL Ph.D. Thesis
Paul Chia Pu Wang 1973 101 p
Avail: Univ. Microfilms Order No. 74-8941

Adaptive gain control designs in statistical communication systems are discussed. Both deterministic and probabilistic models of AGC are considered. Fundamental results are reviewed. Parametric AGC is considered, beginning from the simplest case with the p.d.f. (probability density function) of input signal well-defined, to the cases in which a parameter of the distribution is unknown. To treat signal fading when the functional form of the p.d.f. of input signal is unknown or varying as in some rapid fading situations, a nonparametric approach is developed. One nonparametric algorithm derived from Kolmogorov-Smirnov theorem is presented in this dissertation. Convergence of the schemes developed is demonstrated. Finally, the efficiency between parametric and nonparametric algorithms is considered. Dissert. Abstr.

N74-22887 Wisconsin Univ., Madison.
ACTIVE RC OSCILLATOR ARRAYS Ph.D. Thesis
Herbert Michael Aumann 1973 191 p
Avail: Univ. Microfilms Order No. 74-469

An analysis of active, lumped parameter, quasi-linear one and two-dimensional networks which support standing waves is presented. By introducing normal mode equivalent circuits, a unified theory is developed for dealing with these networks. Equivalent linearization and energy perturbation are applied to the normal mode equivalent circuits to determine the amplitude and stability of the standing wave modes of oscillation. A more rigorous analysis of such networks by numerical methods, which are not hampered by the quasi-linear approximation, is also given. Dissert. Abstr.

N74-22888# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EXPLOSIVE ELECTRON EMISSION AND THE CHARACTERISTICS OF HIGH-CURRENT ELECTRON FLOW Final Report, Oct. 1970 - Jan. 1973
Robert K. Parker Feb. 1974 299 p refs
(AD-775992; AFWL-TR-73-92) Avail: NTIS CSCL 20/7

Within the past several years, an increasing effort has been concentrated on the development of high-current, relativistic electron beams. Initially, this effort had been impeded by limitations in the high-voltage and pulsed-power technology required to develop pulsed, high-power electron accelerators. These technologies have been developed to a level where powers on the order of 10 to the 13th power watts are now available for time durations of approximately 100 nanoseconds. Emphasis has more recently been centered on controlling and concentrating these beams. The initial behavior of the beam within the diode region of the accelerator becomes an extremely critical element. The high-current, cold-cathode diode which is distinguished by non-self-convergent electron flow has been studied to define operative electron emission mechanisms, to determine the dominant plasma phenomena within the interelectrode volume, to classify the modes of electron flow, and to verify the Friedlander beam convergence criterion. (Modified author abstract) GRA

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-22889*# Hughes Aircraft Co., Torrance, Calif. Space Simulation Lab.
TEST FACILITY FOR 6000 HOUR LIFE TEST OF 30 cm MERCURY ION THRUSTER
J. J. Caldwell Nov. 1973 15 p refs
(Contract NAS3-15523)
(NASA-CR-138249; SCG-30361T) Avail: NTIS HC $4.00 CSCL 14B

The environmental and instrumentation requirements for long term testing of electrical propulsion thrusters which impose severe and unusual requirements upon the simulation facility were studied. High speed ions ejected from a mercury thruster erode material from collecting surfaces, which is then scattered and redeposited upon other surfaces, with resultant damage to the chamber and test article. By collecting the thruster plume on a frozen mercury surface damage to the thruster and chamber by back-scattered erosion products was minimized. Provisions for unattended operation, remote data acquisition, personnel safety, and instrumentation for assessing thruster performance are also discussed. Author

N74-22890*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASA DIRECTORY OF OBSERVATION STATION LOCATIONS, VOLUME 1
Nov. 1973 258 p refs Prepared by Computer Science Corp., Falls Church, Va.
(NASA-TM-X-69902-VOL-1) Avail: NTIS HC $16.00 CSCL 14B

Geodetic information for NASA tracking stations and for observation stations cooperating in NASA geodetic satellite programs is presented. A Geodetic Data Sheet is provided for each station, giving the position of the station and describing briefly how it was established. Geodetic positions and geocentric coordinates of these stations are tabulated on local or major geodetic datums and on selected world geodetic systems. The principal tracking facilities used by NASA, including the Spaceflight Tracking and Data Network, the Deep Space Network, and several large radio telescopes are discussed. Positions of these facilities are tabulated on their local or national datums, the Mercury Spheroid 1960, the Modified Mercury Datum 1968, and the Spaceflight Tracking and Data Network System. Observation stations in the NASA Geodetic Satellites Program are included along with stations participating in the National Geodetic Satellite Program. Positions of these facilities are given on local or preferred major datums, and on the Modified Mercury Datum 1968. Author

N74-22891*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASA DIRECTORY OF OBSERVATION STATION LOCATIONS, VOLUME 2
Nov. 1973 443 p refs Prepared by Computer Sciences Corp., Falls Church, Va.
(NASA-TM-X-69902-VOL-2) Avail: NTIS HC $25.25 CSCL 14B

For abstract, see N74-22890.

N74-22892*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
THE EVOLUTION OF ELECTRONIC TRACKING, OPTICAL, TELEMETRY, AND COMMAND SYSTEMS AT THE KENNEDY SPACE CENTER
W. R. McMurran, ed. 17 Apr. 1973 63 p refs
(NASA-TM-X-70077) Avail: NTIS HC $6.25 CSCL 22D

A history is presented of the major electronic tracking, optical, telemetry, and command systems used at ETR in support of Apollo-Saturn and its forerunner vehicles launched under the jurisdiction of the Kennedy Space Center and its forerunner organizations. Author

N74-22893# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Aerodynamique 1.
COMMAND AND CONTROL OF A VARIABLE DENSITY WIND TUNNEL [COMMANDE ET REGULATION D'UNE SOUFFLERIE A DENSITE VARIABLE]
Alain Becker, Enrique Kornberg, and Didier Rault 1973 106 p In FRENCH
Avail: NTIS HC $8.50

A project for command and control of a variable density subsonic wind tunnel by keyboard selection of Reynolds and Mach numbers is presented. The wind tunnel subsystems are described with regard to fan variable frequency motor command chain, dynamic pressure regulation and parameter identification, wind tunnel response delay function, Bode charts, Black charts, and optimization. Pressure regulation is discussed with regard to losses, pressure response, identification, modelization and system performance. Temperature distribution problems are outlined. ESRO

N74-22894# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Dept.
VIBRATION EQUIPMENT. DESCRIPTION OF THE VIBRATION TEST LABORATORY AT THE SPACE DEPARTMENT OF FOKKER-VFW PLANT SCHIPHOL
F. N. Naber 3 Jan. 1973 14 p
(FOK-RV-73-3) Avail: NTIS HC $4.00

A description is presented of a vibration test facility consisting of two electromagnetic vibrators, of 2700 kgf and 250 kgf thrust. A console with electronic control, recording and analyzing equipment is available. The facility has been used for vibration testing of small satellites, satellite components, airborne compounds, and industrial items. ESRO

N74-22895# National Aerospace Lab., Amsterdam (Netherlands).
[AEROSPACE RESEARCH ACTIVITIES] Annual Report, 1972 [VERSLAG OVER HET JAAR 1972]
1973 118 p refs In DUTCH; ENGLISH summary
Avail: NTIS HC $9.00

The 1972 annual report of the Netherlands Aerospace Laboratory is presented. Areas covered include fluid flow, combustion, propulsion, structures, materials, aircraft, spacecraft, and environmental science. ESRO

N74-22896# European Space Research Organization, Paris (France).
DIFFICULTIES EXPERIENCED DURING THE BAROMETRIC DISCHARGING OF LIQUIDS FROM A VACUUM BY MEANS OF GRAVITY TUBES
H. Lambrecht Mar. 1974 27 p refs Transl. into ENGLISH of Schwierigkeiten beim barometrischen Ausschleusen von Fluessigkeiten aus dem Vakuum mittels Fallrohren, DLR-Mitt-73-10, DFVLR, 15 Jan. 1973
(ESRO-TT-39; DLR-Mitt-73-10) Copyright. Avail: NTIS HC $4.50; DFVLR, Porz-Wahn: 11,50 DM

The barometric discharging of liquid, used to cool rocket exhaust gases by means of gravity tubes, and its efficiency improvement by means of an air vent, is discussed. This cooling system is used at rocket test stands, and the cooling of the exhaust gases is obtained by passing the gases through a liquid spray. Unexpectedly high inflow heights can result during the barometric discharging of these liquids by means of gravity tubes. By applying a pipe venting system low inflow heights can be achieved for the same geometric dimensions. The efficiency of this venting system was demonstrated by experiments with a spray cooler for rocket exhaust gases. ESRO

N74-22897# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
AN ANALYTICAL AND EXPERIMENTAL STUDY OF AN IMPLOSION-DRIVEN SHOCK TUBE
S. K. Chan Aug. 1973 163 p refs
(Grant AF-AFOSR-2274-72; AF Proj. 9783)
(AD-775054; UTIAS-191; AFOSR-74-0190TR) Avail: NTIS CSCL 14/2

The UTIAS Implosion Driver uses the wave dynamics of a hemispherical implosion to raise the pressure and temperature of its driver gas to extreme values. Strong planar shock waves are thereby generated which alleviate the current shock-velocity plateau of conventional shock tubes. An analytical and experimental study was made of the performance of a 1-in dia shock tube driven by an 8-in dia hemispherical implosion driver. The analytical performance of the shock tube was predicted by numerically solving the set of governing nonlinear partial differential equations including appropriate loss mechanisms in the different regimes of the flow. A simplified solution was developed in the form of a simple equation allowing the maximum expected shock velocity to be predicted for a given set of initial conditions. (Modified author abstract) GRA

N74-22898# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT ROYAL AIR FORCE ALCONBURY, ENGLAND Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Feb. 1974 37 p
(AF Proj. 683M)
(AD-775154; AFWL-TR-73-260) Avail: NTIS CSCL 01/5

The data collected during the Air Force Weapons Laboratory's standard skid-resistance test conducted at Royal Air Force Alconbury, England on 20 November 1972 are analyzed. The test results indicate the porous friction surface at Royal Air Force Alconbury had good skid-resistance properties, and no corrective action was indicated at the time of the test. Author (GRA)

N74-22899# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT ROYAL AIR FORCE WOODBRIDGE, ENGLAND Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Feb. 1974 34 p ref
(AF Proj. 683M)
(AD-775155; AFWL-TR-73-261) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory's standard skid-resistance test conducted at Royal Air Force (RAF) Woodbridge, England, on 26 November 1972 are analyzed. The test results indicate the runway surface at RAF Woodbridge had generally good skid-resistance properties, and no corrective action was indicated at the time of the test. Because the measured stopping-distance ratios put the runway surface at the edge of the range for good skid-resistance properties, the runway surface should be retested in approximately 18 months. Author (GRA)

N74-22900# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT BITBURG AIR BASE, GERMANY Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Feb. 1974 42 p refs
(AF Proj. 683M)
(AD-775156; AFWL-TR-73-262) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory's standard skid-resistance test conducted at Bitburg AB, Germany, on 12 November 1972 are analyzed. The test results indicate the runway surface had good skid-resistance properties, and no corrective action was indicated at the time of the test. Author (GRA)

N74-22901# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EVALUATION OF RUNWAY SKID-RESISTANCE CHARACTERISTIC AT HAHN AIR BASE, GERMANY Final Report, 1 Nov. 1972 - 30 Jun. 1973
George D. Ballentine and Phil V. Compton Feb. 1974 33 p refs
(AF Proj. 683M)
(AD-775157; AFWL-TR-73-263) Avail: NTIS CSCL 01/5

Data gathered during the Air Force Weapons Laboratory's standard skid-resistance test conducted at Hahn AB, Germany, on 15 November 1972 are analyzed. The test results indicate the porous friction surface at Hahn AB had good skid-resistance properties, and no corrective action was indicated at the time of the test. Author (GRA)

N74-22902# Boeing Vertol Co., Philadelphia, Pa.
GROUND-BASED SIMULATOR INPUT DATA FOR ADVANCED TANDEM ROTOR HELICOPTERS Final Report, Jun. 1972 - Aug. 1973
Roman T. Lytwyn and Fred White Jan. 1974 247 p refs
(Contract DAAJ02-72-C-0095; DA Proj. 1F1-62204-AA-44)
(AD-775837; USAAMRDL-TR-73-104) Avail: NTIS CSCL 01/3

Four crane-type tandem-rotor helicopters with the gross weight capability of 50,000 lb, 80,000 lb, 120,000 lb, and 200,000 lb are defined in terms of rotor and fuselage parameters and the resulting dynamic characteristics. An automatic precision hover system (PHS) is synthesized and the hover hold system performance is established analytically including aircraft position errors and pilot station acceleration environment as a function of low speed turbulence. In addition, pilot modeling techniques are utilized to estimate the performance and rating for various attitude and linear velocity control response modes without the aid of automatic hold functions. (Modified author abstract) GRA

N74-22903# ARO, Inc., Arnold Air Force Station, Tenn.
COMPONENT PERFORMANCE AND STABILITY CHARACTERISTICS OF AN ENGINE PROPULSION SIMULATOR WITH UNIFORM AND DISTORTED INLET PRESSURE PROFILES AT REYNOLDS NUMBER INDICES OF 0.39, 0.78, AND 0.91 Final Report, 5 Jun. 1972 - 10 Feb. 1973
C. R. Darlington, R. M. Brooksband, and J. O. Brooks AEDC Mar. 1974 80 p refs
(AD-775996; ARO-ETF-TR-73-108; AEDC-TR-73-172) Avail: NTIS CSCL 14/2

An investigation was conducted on an engine propulsion simulator (S/N 001/02) to determine sea-level-static component performance and to determine the compressor performance and stability characteristics with uniform and distorted inlet pressure profiles at Reynolds number indices of 0.39 and 0.78. Steady-state component performance data are presented and are compared with predicted data. The effect of Reynolds number indices and the effect of circumferential inlet distortion of the compressor performance are shown. Author (GRA)

N74-22904# Texas Technological Univ., Lubbock.
STRUCTURAL REPAIR OF BOMB DAMAGE TO AIRFIELD RUNWAYS Final Report, 18 Dec. 1971 - 19 Nov. 1973
Jimmy H. Smith and William W. Morris Feb. 1974 200 p refs
(Contract F29601-72-C-0043; AF Proj. 683M)
(AD-776074; AFWL-TR-73-214) Avail: NTIS CSCL 01/5

The study develops techniques for rapidly repairing bomb damaged runways. Structural concepts for filling and/or spanning the crater were studied. Spanning systems, such as clear span and intermediate support systems, structural fill systems including interlocking fills, and waterbag systems were considered as possible solutions. Only one concept, a honeycomb structural fill technique, fulfilled the requirements of simplicity, speed, and dependability to merit further testing. This technique consists of filling a large portion of the crater with several modules constructed of interconnected, vertically placed polyvinyl chloride (PVC) pipes. Laboratory tests were conducted on bonding agents, capacity of individual pipe, several different size modules, and various module arrangements. The F-111 aircraft wheel loads were considered as the design loading. Results of these tests led to a PVC module design for full-scale field tests. (Modified author abstract) GRA

N74-23007 Swedish Space Corp., Solna
ESRANGE
In ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 207-214 (For availability see N74-22980 14-13)

N74-23008 Andoya Rocket Range, Andenes (Norway).
FACILITIES AT ANDOYA ROCKET RANGE
A. Gundersen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 215-221 (For availability see N74-22980 14-13)

N74-23009 Danish Meteorological Inst., Copenhagen.
SOENDRE STROEMFJORD ROCKET RANGE, GREEN-

LAND
T. Stockflet Joergensen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 223-226 (For availability see N74-22980 14-13)

N74-23486 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.
PROGRESS IN THE DEVELOPMENT OF A VERSATILE AIRBORNE SIMULATOR FOR V/STOL AIRCRAFT
W. S. Hindson, K. Lum, and W. E. B. Roderick *In* Natl. Res. Council of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Est., 1 Jan. - 31 Mar. 1974 31 Mar. 1974 p 25-51 refs (For availability see N74-23483 14-34)

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-22905 Brown Univ., Providence, R.I.
THE DETERMINATION OF THE SECOND NORMAL STRESS DIFFERENCE IN VISCOELASTIC FLOWS Ph.D. Thesis
You Ti Kuo 1973 135 p
Avail: Univ. Microfilms Order No. 74-3040

The measurement of the second normal stress difference in a viscoelastic flow in an open semicircular inclined channel is discussed and associated theory is given. The theory shows that simple correlations exist for the second normal stress difference, the shear stress, and the profile (or the deflection) of the free surface of the flow. It leads to a formulation of the second normal stress in a polynomial form of shear stress, in which the coefficients are to be determined from a measured surface profile. A treatment of surface tensions, whose severe effect has been ignored in the previous analysis and in the other conventional methods, is given as an integral part of the formulation. In addition, a correction for the shear stress due to deviations from truly viscometric flow is also obtained. Dissert. Abstr.

N74-22906 Oklahoma State Univ., Stillwater.
FLUID LINE DYNAMICS WITH THROUGH FLOW AND FINITE AMPLITUDE DISTURBANCES Ph.D. Thesis
Richard Paul Braden 1973 127 p
Avail: Univ. Microfilms Order No. 74-7966

An analytical study of the Equations of Motion and the Energy Equation for a viscous, compressible fluid, (either an ideal gas or a liquid), in a rigid transmission line of constant circular cross section is presented. The principal limitations of the analysis are: (1) the disturbances are assumed to be laminar in nature and (2) the through flow is assumed to be laminar, incompressible flow. A generalized transmission line model which is independent of terminal constraints is derived in the Laplace domain, and suitable approximations are given so the model may be inverse transformed to the time domain. The model with its approximations is primarily a low frequency model, valid up to the first natural frequency of the line. The model is compared with experimental data in both the time and frequency domains. The effect of finite amplitude disturbances is examined primarily in the time domain, whereas the through flow is examined in the frequency domain. Dissert. Abstr.

N74-22907+ Ecole Nationale Superieure d'Electronique d'Informatique et d'Hydraulique, Toulouse (France). Inst. de Mecanique des Fluides.
IN SITU MEASUREMENT METHODS OF RHEOLOGICAL CHARACTERISTICS IN NON-NEWTONIAN FLUIDS Final Report [ETUDE DES CARACTERISTIQUES RHEOLOGIQUES DES FLUIDES NON NEWTONIENS. PROCEDES DE MESURE IN SITU COMPTE RENDU DE FIN DE CONTRACT]
Claude Thirriot and Michel Sengelin Dec. 1972 22 p In FRENCH
(Contract DGRST-69-01-855)
Avail: NTIS HC $4.25

A bibliography of 250 publications dealing with non-Newtonian flows is synthetized and analyzed. Of the papers 50% are theoretical, 35% deal with experimental matters, and 15% deal with industrial topics. A national enquiry campaign was carried out on a universe of 1800 producers or users of non-Newtonian fluids in various industrial fields. The methodology and summary of results are given. Specific rheological and thermophysical studies on non-Newtonian fluids were performed. A Joukovski profile branching device inducing low perturbations was examined. Various singularities were examined and calibrated in view of their use for flowmeters or rheometers in situ. The results are, as far as possible, expressed in nondimensional form. Author (ESRO)

N74-22908# Lockheed Missiles and Space Co., Palo Alto, Calif.
NUMERICAL SOLUTION OF THE SIDE INTERACTION OF UNDEREXPANDED SUPERSONIC IDEAL GAS JETS WITH A PLANE AND WITH EACH OTHER
M. Ia. Ivanov and V. P. Nazarov 17 Oct. 1972 9 p refs Transl. into ENGLISH from Zh. Vychisl. Mat. i Mat. Fiz. (USSR), vol. 14, no. 1, 1974 p 179-187
Avail: NTIS HC $4.00; National Translations Center, John Crerar Library, Chicago, Ill. 60616

Some results are presented of an investigation of the side interaction of several identical axisymmetric jets with each other and with a plane at angles of encounter not exceeding the limit (in this case the limit angle is understood to be the value at which the velocity component parallel to the plane of interaction becomes equal to the speed of sound). The three-dimensional supersonic flow equations are integrated numerically by a through-computation finite difference scheme which is proposed and tested. Author

N74-22909*# Scientific Translation Service, Santa Barbara, Calif.
ERRORS IN WALL FRICTION MEASUREMENTS PERFORMED WITH THE AID OF A FLOATING ELEMENT BALANCE IN A TURBULENT FLOW WITH A MODERATE ADVERSE PRESSURE GRADIENT
N. D. Vinh Washington NASA May 1974 8 p refs Transl. into ENGLISH from Compt. Rend., Ser. A: Sci. Math. (France), v. 277, no. 22, 5 Dec. 1973 p 1115-1117
(Contract NASw-2483)
(NASA-TT-F-15590) Avail: NTIS HC $4.00 CSCL 20D

The use of a floating element balance for determining the wall friction in a turbulent boundary layer with moderate adverse pressure gradients is not limited by the existence of secondary forces. In effect, no corrections are necessary if a floating element is selected with a sufficiently small thickness in order to suppress the force due to the distribution of the static pressure in the interior of the slot. In addition, by reducing the tank pressure, the air produced by the flow through the slot is minimized. Author

N74-22910# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
AN APPROXIMATE APPROACH TO BASE FLOW BEHIND TWO DIMENSIONAL REARWARD-FACING STEPS PLACED IN A UNIFORM SUPERSONIC STREAM
Keiichi Karashima and Kiyoshi Hasegawa Nov. 1973 29 p refs
(ISAS-501-Vol-38-No-12) Avail: NTIS HC $4.50

An approximate approach to base flow behind two-dimensional rearward-facing steps followed with a flat plate placed in a uniform supersonic stream is developed. The flow field is characterized by a reattaching flow involving the interaction between a shock wave and a turbulent boundary layer near the solid surface. The theoretical development is made on the basis of a modified momentum integral method, in which mixing between an internal dissipative flow and an external nearly isentropic stream is assumed to be of the essential physical process. It is shown that the reattaching flow is capable of supporting considerable pressure increases at high speeds and a correlation can be reasonably obtained between base pressure and Reynold-shape parameter which corresponds to the ratio of thickness of the oncoming boundary layer to the step height. Numerical calculation of base pressure is carried out for free stream Mach numbers of 1.5, 2.0 and 3.1, and the results are compared with existing data. Author

N74-22911# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
GAS-LIQUID LAMINAR BOUNDARY-LAYER FLOWS WITH A PHASE-CHANGING INTERFACE AND ITS HYDRODYNAMIC INSTABILITY
Susumu Kotake Jan. 1974 48 p refs
(ISAS-505-Vol-39-No-2) Avail: NTIS HC $5.50

Laminar boundary-layer flows of gas and liquid having a phase-changing interface at their common boundary are studied theoretically to predict their aspect of flow and thermal fields first in the steady state. By using these results and examining their perturbed fields with small wavy disturbance, the disturbance flow fields and the hydrodynamic instability of the system are investigated. The phase-change at the interface has a considerable effect on the velocity and temperature profiles, thus on the coefficients of skin-friction and heat-transfer at the interface. Intense evaporation decreases the velocity and temperature gradients at the interface. The wavy disturbances on the interface have influence on the heat-transfer at the interface by one order of magnitude less than on the skin-friction. The small wavy disturbance fields show a hydrodynamic instability similar to that of boundary-layer flows on a rigid wall. Author

N74-22912# Tokyo Univ. (Japan).
AN ANALYSIS OF SHOCK WAVES IN BINARY GAS MIXTURES WITH SPECIAL REGARD TO TEMPERATURE OVERSHOOT
Kanji Abe (Kyushu Univ.) and Hakuro Oguchi Mar. 1974 13 p refs
(ISAS-511-Vol-39-No-8) Avail: NTIS HC $4.00

Shock wave structures in argon-helium mixtures are numerically analysed on the basis of a kinetic model for binary gas mixtures. The results are compared with Harnett and Muntz' experiment, and reasonable agreement between computation and experiment is found. Special attention is paid to the overshoot phenomena of argon temperature. The argon temperature overshoot is shown from the results to occur for a sufficiently small mole fraction of argon. Such overshoot is also shown to occur for a comparatively larger mole fraction of argon, as the shock Mach number becomes higher. Author

N74-22913# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
A KINETIC THEORY OF TURBULENCE. 1: ON THE HYPOTHESIS OF MOLECULAR CHAOS AT THREE AND FOUR PARTICLE LEVELS
Shunichi Tsuge Dec. 1973 21 p refs
(ISAS-502-Vol-38-No-13) Avail: NTIS HC $4.25

Two schemes are proposed for kinetic equations which form bases of treating shear and grid-produced turbulence. The first scheme is the BBGKY hierarchy system truncated at n equals 2 by invoking ternary molecular chaos. The one-point kinetic equation turns out to yield the Navier-Stokes equation with Reynolds stress, and the two-point equation affords the governing differential equation for the Reynolds stress. These equations constitute, along with the boundary-layer approximation, equations determining basic shear flow and Reynolds stress simultaneously. The second scheme designed for grid turbulence is the same except that the equations are truncated at n equals 3. In contrast to conventional analyses which have bases on a parabolic type equation depending on time and relative locations of pertaining points, an equation of elliptic type is derived, and a closed form solution which varies with streamwise coordinate is obtained for cases where the four-point correlation is neglected. Author

N74-22914# Advisory Group for Aerospace Research and Development, Paris (France).
ADVANCES IN NUMERICAL FLUID DYNAMICS
Feb. 1973 146 p refs
(AGARD-LS-64) Avail: NTIS HC $10.50

Lectures are presented on the theory of numerical stability for linear and nonlinear hyberbolic and parabolic equations; fundamental aspects of integration procedures for nonlinear flow problems including shocks by finite difference techniques; and fundamental concepts extensions, and generalizations of the finite element methods. For individual titles, see N74-22915 through N74-22921.

N74-22915 Uppsala Univ. (Sweden). Dept. of Computer Sciences.
BOUNDARY CONDITIONS FOR DIFFERENCE APPROXIMATION OF HYPERBOLIC DIFFERENTIAL EQUATIONS
Heinz Otto Kreiss *In* AGARD Advan. in Numerical Fluid Dyn. Feb. 1973 13 p refs (For availability see N74-22914 14-12)

Time dependent problems involving the processes of wave propagation and diffusion are dealt with. Solutions are given for calculating the boundary conditions and the difference approximation for hyperbolic differential equations in one space dimension. Separate solutions are shown for equations in more than one space dimension. D.L.G.

N74-22916 New York Univ., N.Y. Courant Inst. of Mathematical Studies.
NONLINEAR TIME DEPENDENT PROBLEMS IN FLUID DYNAMICS
Samuel Z. Burstein *In* AGARD Advan. in Numerical Fluid Dyn. Feb. 1973 20 p refs (For availability see N74-22914 14-12)

Three nonlinear problems in inviscid fluid dynamics are discussed. First we consider unforced finite amplitude vibrations of an undamped gas in a resonant cavity. The effect of amplitude on the vibrational frequency and wave shape is obtained by numerical integration of the complete nonlinear equations. The second problem is a nonlinear vibration problem with finite amplitude motion generated by a thermal forcing function. The forcing function is represented by a dilute spray of combustible fuel droplets in an oxidizing environment. In the last problem a computation in transonic flow is described. Author

N74-22917 Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
NUMERICAL INTEGRATION OF NAVIER-STOKES EQUATIONS
H. J. Wirz and J. J. Smolderen *In* AGARD Advan. in Numerical Fluid Dyn. Feb. 1973 13 p refs (For availability see N74-22914 14-12)

The Eularian form of the Navier-Stokes equations is analyzed. A system of partial differential equations is obtained by expressing the conservation of mass, momentum, and energy in Eularian coordinates. Several categories of boundary conditions are considered together with selected discretization methods. The requirements of convergence, consistency, and stability are dealt with as well as the aspects of accuracy and error bounds. D.L.G.

N74-22918 Technische Hochschule, Aachen (West Germany). Aerodynamisches Inst.
NUMERICAL TREATMENT OF BOUNDARY-LAYER PROBLEMS
Egon Krause *In* AGARD Advan. in Numerical Fluid Dyn. Feb. 1973 21 p refs (For availability see N74-22914 14-12)

Finite difference solutions for three-dimensional compressible laminar, and incompressible turbulent boundary layers are discussed in detail. Several finite difference approximations are introduced with their respective stability limits as obtained from a linearized stability analysis and numerical calculation. The importance of the domain of dependence and the region of influence in three-dimensional boundary layers is elucidated. The equations of motion are given in orthogonal and non-orthogonal coordinates. A discussion of surface and external flow orientated system of coordinates is included. For turbulent flows the eddy viscosity concept expressed through a mixing length is adopted for the description of the turbulent shear stresses. Three different approximations used in the recent literature for closure assumptions are compared with the transport equations for the components of the turbulent shearing stress in three-dimensional flows as given by Bradshaw. The finite difference solution employed is an implicit one which does not require additional assumptions for the laminar sublayer. Second and fourth order finite difference approximations enable acceptable computation times. Several results of sample calculations demonstrate the application of the method presented. Author

N74-22919* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SURVEY OF COMPUTATIONAL METHODS FOR THREE-DIMENSIONAL SUPERSONIC INVISCID FLOWS WITH

SHOCKS
R. W. MacCormack and R. F. Warming *In* AGARD Advan. in Numerical Fluid Dyn. Feb. 1973 20 p refs (For availability see N74-22914 14-12)

Hyperbolic systems of partial differential equations governing supersonic inviscid flows are discussed and analyzed. Finite-difference analogues for integrating these systems in the interior of fluid domains are described from two points of view: a differential form approach and an integral form approach. The algorithms presented are analyzed for stability and accuracy. The concept of time splitting is discussed and supplied to these methods to achieve increased numerical efficiency. Techniques for treating conditions at the boundaries of the fluid domain and shock-wave discontinuities at surfaces within the domain are described. Author

N74-22920 General Dynamics/Astronautics, San Diego, Calif. Aerospace Div.
A SURVEY OF COMPUTATIONAL METHODS FOR 2D AND 3D TRANSONIC FLOWS WITH SHOCKS
H. Yoshihara *In* AGARD Advan. in Numerical Fluid Dyn. Feb. 1973 35 p refs (For availability see N74-22914 14-12)

More recent developments in the calculation of steady transonic flows with shocks using the finite difference procedure are reviewed. For the planar case the unsteady procedure of Magnus-Yoshihara (exact), and the steady relaxation procedures of Murman-Cole (small disturbance), Garabedian-Korn (exact), and Jameson (exact) are described, stressing their viability particularly in terms of their ability to capture the embedded shocks properly. Numerous examples are presented. The review is then concluded by a description of several axial symmetric and three dimensional calculations carried out by NASA. Author

N74-22921 Edinburgh Univ. (Scotland). Fluid Mechanics Unit.
NUMERICAL TREATMENT OF FLUID DYNAMICAL STABILITY PROBLEMS
M. A. S. Ross *In* AGARD Advan. in Numerical Fluid Dyn. Feb. 1973 24 p refs (For availability see N74-22914 14-12)

Various theories are reviewed which led up to the modified Rayleigh model for finite amplitude disturbances. The derivation and properties of the Orr-Sommerfeld equation are given along with applications for parallel flows bounded by solid walls, plane poiseuille flow, and eigenfunction expansions. Published numerical methods and models for the development of turbulence are reviewed which include: implicit methods, explicit methods, single function methods, parallel function methods, and the treatment of orthonormalization. D.L.G.

N74-22922*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AERODYNAMIC DRAG AND FUEL SPREADING MEASUREMENTS IN A SIMULATED SCRAMJET COMBUSTION MODULE
Louis A. Povinelli Washington May 1974 37 p refs
(NASA-TN-D-7674; E-7849) Avail: NTIS HC $3.25 CSCL 21A

The drag of a simulated scramjet combustion module was measured at Mach 2, 2.5, and 3. The combustor was rectangular in cross section and incorporated six swept fuel injector struts. The effect of strut leading edge radius, position of maximum thickness, thickness ratio, sweep angle, and strut length on the drag was determined. Reduction in thickness ratio had the largest effect on drag reduction. Sweeping the struts upstream yielded the same drag as sweeping the struts downstream and potentially offers the advantages of increased mixing time for the fuel. Helium injection was used to simulate hydrogen fuel. The interstrut spacing required to achieve good distribution of fuel was was found to be about 10 jet diameters. The contribution of helium injection to drag reduction was small. Author

N74-22923*# Advanced Technology Labs., Inc., Westbury, N.Y.
METHODOLOGY FOR THREE DIMENSIONAL NOZZLE DESIGN
A. Ferri, S. Dash, and P. DelGuidice Mar. 1974 34 p refs
(Contract NAS1-12104)
(NASA-CR-132438; ATL-TR-195) Avail: NTIS HC $4.75 CSCL 20D

Criteria for the selection and methods of analysis for designing a hypersonic scramjet nozzle are discussed. The criteria are based on external and internal flow requirements, related to drag, lift, and pitching moments of the vehicle and thrust of the engine. The steps involved in establishing the criteria are analyzed. Mathematical models of the design procedure are provided. Author

N74-22924*# Advanced Technology Labs., Inc., Westbury, N.Y.
MANUAL FOR SOURCE FLOW CHARACTERISTICS PROGRAM
Paul P. Kalben Apr. 1974 71 p
(Contract NAS1-12104)
(NASA-CR-132439; ATL-TM-179) Avail: NTIS HC $6.75 CSCL 20D

A computer program for analyzing the nozzle for a hypersonic scramjet by a second order characteristic procedure is described. The program used FORTRAN IV. The input routine is provided. A sample input for a source flow case is included. Author

N74-22925*# Advanced Technology Labs., Inc., Westbury, N.Y.
A SOURCE FLOW CHARACTERISTIC TECHNIQUE FOR THE ANALYSIS OF SCRAMJET EXHAUST FLOW FIELD
P. DelGuidice, S. Dash, and P. Kalben Mar. 1974 65 p refs
Sponsored by NASA
(NASA-CR-132437; ATL-TR-186) Avail: NTIS HC $6.25 CSCL 20D

The factors which influence the design and selection of a nozzle for a hypersonic scramjet are described. A two dimensional second-order characteristic procedure capable of analyzing the aerodynamic performance of typical nozzle configurations is presented. Equations of motion governing the two dimensional, axisymmetric, or axially expanding inviscid flow of a gas mixture, with frozen chemistry, are provided. Diagrams of the flow conditions for various configurations are included. Author

N74-22926*# Advanced Technology Labs., Inc., Westbury, N.Y.
A NUMERICAL PROCEDURE FOR THE PARAMETRIC OPTIMIZATION OF THREE DIMENSIONAL SCRAMJET NOZZLES
S. Dash, P. DelGuidice, and P. Kalben Oct. 1973 81 p refs
Sponsored by NASA
(NASA-CR-132440; ATL-TR-188) Avail: NTIS HC $7.25 CSCL 20D

A numerical procedure permitting the rapid determination of the internal performance of a class of scramjet nozzle configurations is presented. The approach developed is based on the construction of quasi two dimensional simple wave networks, where lateral expansion effects are incorporated by one dimensional approximations. A numerical procedure following this approach has has been developed and results obtained are highly comparable to those obtained employing a characteristic procedure. The numerical program developed permits the parametric variation of cowl length, turning angles on the cowl and vehicle undersurface and lateral expansion and is subject to fixed constraints such as the vehicle length and nozzle exit height. The program requires uniform initial conditions at the burner exit station and yields the location of all predominant wave zones, accounting for lateral expansion effects. In addition, the program yields the detailed pressure distribution on the cowl and vehicle undersurface and calculates the nozzle thrust, lift and pitching moment. Author

N74-22927# National Aerospace Lab., Tokyo (Japan).
PATH AND INDUCED FIELD OF A JET EXHAUSTING AT A LARGER ANGLE INTO A UNIFORM CROSS FLOW
Hiroshi Endo, Teruomi Nakaya, Shigeru Hidawa, Naoaki Kuwano, and Nobuhiro Toda Oct. 1973 26 p refs In JAPANESE; ENGLISH summary
(NAL-TR-343) Avail: NTIS HC $4.50

A semiempirical method is presented which calculates the path and the induced velocity of a round turbulent jet exhausting into a uniform cross flow. By analogy with a suction cylinder and based on a vortex sheet theory, the jet is replaced by a vortex doublet which is an idealized representation of the trailing vortex sheet on the surface of the jet, the induced velocity around the jet being assumed as induced by the vortex doublet. The comparison of calculated downwash and sidewash angles of the induced flow with experimental results obtained in 6 M low speed wind tunnel prove that the present method can be used as a working basis for investigating the interaction prove with the airframe of a jet-lift VTOL aircraft through the far induced field of exhaust gas. Author

N74-22928# European Space Research Organization, Paris (France).

LA RECHERCHE AEROSPATIALE. BI-MONTHLY BULLETIN NO. 1973-1

Mar. 1974 98 p refs Transl. into ENGLISH of la Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 1-52

(ESRO-TT-37) Avail: NTIS HC $8.00

Research in the following areas is described: fairings at wing fuselage junctions, optimization of apogee impulses, starting conditions, pressure and flow in blade cascades, and triggering devices for recording variable phenomena. For individual titles, see N74-22929 through N74-22935.

N74-22929 European Space Research Organization, Paris (France).

FAIRINGS AT WING FUSELAGE JUNCTIONS c01

Robert G. Legendre *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 1-10 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 1-4 (For availability see N74-22928 14-12)

The benefit of seeking a compromise in the design of fairings at wing-fuselage junctions is established. Methods of investigation available for research into such a compromise are reviewed. Mechanisms for forming turbulent eddies is described for the simple case of a duct. This mechanism serves as a basis for the interpretation of phenomena observed in the vicinity of a fairing at a wing root. Some considerations on the unsteady nature of the flow are presented. Author (ESRO)

N74-22930 European Space Research Organization, Paris (France).

THE OPTIMIZATION OF THE APOGEE IMPULSE DURING THE POSITIONING OF A GEOSTATIONARY SATELLITE c31

Dominique Biausse, Jean-Pierre Marec et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 11-34 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 5-15 (For availability see N74-22928 14-12)

A procedure for optimizing the position of a geostationary satellite starting from the transfer orbit is presented. The manoeuvre consists of the application of an increment of velocity in the vicinity of the apogee of the transfer orbit, then its final positioning. By the use of matrices, final positioning is treated for the particular case where a long time is available for the manoeuvre. Optimization of the apogee impulse (instant of application and direction) is treated stochastically, taking into account of the scatter in magnitude and direction of this simpulse and the errors of estimating the transfer orbit. Apogee height and the modulus of the apogee impulse are also optimized stochastically by taking into account scatter in the transfer orbit. Author (ESRO)

N74-22931 European Space Research Organization, Paris (France).

STARTING CONDITIONS FOR SUPERSONIC BLADE CASCADES c01

Gilbert Janssens, Jean Pierre Guyot et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 35-49 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 17-23 (For availability see N74-22928 14-12)

A theoretical and experimental study is presented of the starting conditions in supersonic annular blade cascades (high performance turbine stator blading, supersonic annular wind tunnel guide vanes). A distinction is made between blade cascades that provide a flow with a subsonic or a supersonic axial component of the velocity. In the first case, the downstream flow, after starting, is uniform only for a unique value of the pressure ratio; in the second case, starting requires, downstream of the cascade, a divergent duct where a shock wave is established, and a uniform flow is obtained whatever the pressure above the starting pressure. Experiments confirm and clarify the theoretical estimates. Author (ESRO)

N74-22932 European Space Research Organization, Paris (France).

CONTROLLING THE MACH NUMBER DISTRIBUTION BEHIND A SUBSONIC ANNULAR BLADE CASCADE BY MEANS OF THE PRESSURE DROP c01

Jacques Paulon *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 50-60 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 25-29 (For availability see N74-22928 14-12)

In order to determine the effect of stratification, as regards the flow direction and Mach number, of the subsonic helical flow upstream of an annular cascade of blades, a system of pressure drop devices, consisting of successive concentric screens located well upstream of the guide blade cascade, made it possible to obtain behind this cascade a flow having an almost constant Mach number. At the mid-height of the cascade of stator blades, tested with and without this device, the performance was found to be similar. Author (ESRO)

N74-22933 European Space Research Organization, Paris (France).

TWO-DIMENSIONAL SUBSONIC LINEARIZED FLOW THEORY OF THE UNSTEADY FLOW THROUGH A BLADE CASCADE HAVING SMALL CAMBER AND AT LOW INCIDENCE c01

Jacques Leclerc *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 61-76 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 31-39 (For availability see N74-22928 14-12)

A solution is given to the problem of determining local unsteady pressures acting on an infinite two-dimensional cascade of segments, placed in a uniform, subsonic, non-deflected flow, for low amplitude harmonic vibrations. The technique amounts to the solution of an integral equation linking the local lift to the angle of attack on a reference blade, in the configuration where all the blades vibrate harmonically in the same manner, at any value of a fairly constant phase difference between one blade and the next. The kernel is expressed as a series of exponential functions. The case is then taken where the segments are replaced by arcs of small camber in a slightly deflected flow. To take account of these effects to a first order of approximation, it is shown that it is sufficient to modify the expression for the angle of attack in the first problem, the modification corresponding to a velocity perturbation field whose potential is defined by a convolution where the kernel is again expressed by a series of exponential functions. Some numerical results are given. Author (ESRO)

N74-22934 European Space Research Organization, Paris (France).

CALCULATION OF THE UNSTEADY SUBSONIC AERODYNAMIC PRESSURES ON COMPRESSOR BLADES c01

P. Salaun *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 77-90 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan-Feb. 1973 p 41-49 (For availability see N74-22928 14-12)

The blades of an individual row are treated as sections of helicoids placed between two concentric cylinders, in such a way that the row rotates without deviating the air flow. The method of superimposing solutions with separate variables makes it possible to write successively the potentials due to sources, doublets and a distribution of pressure doublets. A study of the nature of the series obtained is necessary in order to be able to write the integral equation of the problem. This is replaced by a system of linear equations, by means of a representation of the pressure and angle of attack in a series of suitable functions.

An outline of the approximate methods of calculation is then given. Author (ESRO)

N74-22935 European Space Research Organization, Paris (France).
TRIGGERING DEVICE FOR THE OPTIMUM RECORDING OF VARIABLE PHENOMENA c14
Georges Baudin *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 91-93 Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 51-52 (For availability see N74-22928 14-12)

A description is given of a triggering device designed to initiate the recording of variable phenomena. The triggering signal is an electric pulse or mechanical contact, and it depends on the maximum voltage carried by the input capacitors. Triggering at constant frequency may be obtained by means of a time based connected to one of the inputs. Author (ESRO)

N74-22936# Institut Franco-Allemand de Recherches, St. Louis (France).
METHOD FOR THE COMPUTATION OF ONE-DIMENSIONAL FLOW BEHIND A TWO-DIMENSIONAL, CYLINDRICAL, OR SPHERICAL SHOCK WAVE (ADAPTATION OF THE WUNDY CODE) [METHODE DE CALCUL DE L'ECOULEMENT MONODIMENSIONNEL DERRIERE UNE ONDE DE CHOC PLANE, CYLINDRIQUE OU SPHERIQUE (ADAPTATION DU CODE WUNDY)]
G. Jaeggy and E. Wachenheim 1 Feb. 1973 57 p refs In FRENCH
(Contract DTEN-72.170)
(ISL-8/73) Avail: NTIS HC $6.00

The need for initial boundary conditions to calculate shock wave propagation in tunnels has led to a variant of the computation method (WUNDY code) which allows for the calculation of wave propagation in free atmosphere in the form of plane, cylindrical, and spherical waves. Basic principles are recalled and flow charts of the actual program are given. Partial results related to one, two, and five megaton explosions are discussed. It is shown that the CRANZ similarity law is obeyed. ESRO

N74-22937# Institut Franco-Allemand de Recherches, St. Louis (France).
WORK CARRIED OUT AT ISL DURING 1972 ON STRONG SHOCK WAVES IN VIEW OF THE STUDY OF BLAST PROPAGATION IN TUNNELS Final Report [REVUE DES TRAVAUX EFFECTUES A L'ISL EN 1972 DANS LE DOMAINE DES ONDES DE CHOC INTENSES, EN VUE DE L'ETUDE DE LA PROPAGATION DES SOUFFLES EN GALERIE COMPTE RENDU FINAL]
L. Bobin and G. Jaeggy 14 Feb. 1973 33 p refs In FRENCH
(Contract DTEN-72.170)
(ISL-NB-2/73) Avail: NTIS HC $4.75

An annotated bibliography of work on tunnel blast attenuation is presented. Ninety-four references are given covering the 1960 to 1973 period. Topics covered include calculation of detonation and propagation, blast wave simulation, strong shock production in a tube, interactions between obstacle and shock wave propagation over various land profiles, penetration and attenuation of shock waves in a tunnel, obstacle-induced wave degradation in a tunnel, and open end tunnel studies. ESRO

N74-22938# Institut Franco-Allemand de Recherches, St. Louis (France).
WORK CARRIED OUT AT ISL ON SIMULATION AND PROPAGATION OF BLAST WAVES IN TUNNELS (BAFFLING EFFECTS, SECTION VARIATIONS, BRANCHING, ETC.) [REVUE DES TRAVAUX EFFECTUES A L'ISL DANS LE DOMAINE DE LA SIMULATION ET DE LA PROPAGATION DES ONDES DE SOUFFLE EN GALERIE (EFFETS DE CHICANES, VARIATIONS DE SECTION, BRANCHEMENTS ECT.)]
A. Kern and L. Bobin 30 May 1973 31 p refs In FRENCH
(Contract DTEN-72.170)
(ISL-NB-4/73) Avail: NTIS HC $4.75

An annotated bibliography on simulation and propagation of blast waves is presented for 58 reports produced between 1960 and 1973. Topics include: calculation of detonation and propagation, blast wave simulation, strong shock production in a tube, interactions between obstacle and shock waves, shock wave propagation over various land profiles, penetration and attenuation of shock waves in a tunnel, obstacle-induced wave degradation in a tunnel, and open end tunnel studies. ESRO

N74-22939# Southwest Research Inst., San Antonio, Tex.
A GENERAL THEORY OF UNSTEADY LOADS ON CAVITATING HYDROFOILS: COMPUTER USE MANUAL
James F. Unruh and R. L. Bass, III Dec. 1973 139 p
(Contract N00014-72-C-0075; SwRI Proj. 02-3271)
(AD-776203) Avail: NTIS CSCL 20/4

The manual describes the computer program which can be used to predict loads on finite aspect ratio, general planform, cavitating hydrofoils with both steady and oscillatory foil motion. The details of the theoretical development for predicting unsteady loads on cavitating hydrofoils are covered in a final report. References to the equations in the final report are made, and the manual should be used in conjunction with the final report. GRA

N74-22940# Naval Academy, Annapolis, Md. Environmental Protection Research and Development Team.
FORCES ON A COANDA SURFACE Final Technical Report
Vincent J. Lopardo 1 Nov. 1973 39 p refs
(AD-775950; USNA-EPRD-1) Avail: NTIS CSCL 20/4

The object of the study was to analyze the forces on a Coanda surface. The surface analyzed was used in an experimental project funded by the Naval Air Systems Command. The final results are based on a numerical integration of the pressure distribution. GRA

N74-22941# Colorado State Univ., Fort Collins.
TURBULENCE INDUCED CHANGES IN VORTEX SHEDDING FROM A CIRCULAR CYLINDER
Kenneth M. Barnett and J. E. Cermak Jan. 1974 241 p refs
(Contract N00014-68-A-0493-0001; NR Proj. 062-414)
(AD-775885; CER73-74KMB-JEC27; TR-26) Avail: NTIS CSCL 20/4

Turbulence effects on vortex shedding from a circular cylinder were investigated in a wind tunnel. Turbulence intensity, near the center of a wind tunnel, was increased by plates of similar geometry with many small holes with blockage ratios from .50 to .97. The Re of all flows was kept near 40,000. Vortex shedding frequency was observed simultaneously by a pressure transducer and a hot wire anemometer. Flow visualization, spectra and transducer output voltages with different wake angles were utilized to estimate transition and separation. Six things were observed that have not been published, to the best of the author's knowledge. (Modified author abstract) GRA

N74-22942# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
EDDY VISCOSITY FOR VARIABLE DENSITY COFLOWING STREAMS
Robert E. Boyle, Jr. and Hermann Viets Dec. 1973 52 p refs
(AF Proj. 7116)
(AD-775990; ARL-73-0172) Avail: NTIS CSCL 20/4

The classical Prandtl eddy viscosity model, which was formulated for an incompressible jet into still air, is modified to account for a density difference between the jet and a non-zero velocity coflowing stream. The constant in the potential core of the Prandtl model is freed and empirically determined as a function of the local mass flux ratio of the secondary to primary flows. The resulting predictions are compared to available axisymmetric jet data. The model is expected to be of use in the computation of thrust augmenting ejector problems where the primary jets are heated by the use of a combination of engine and bypass air. Author (GRA)

N74-22943# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.
EFFECT OF INJECTOR GEOMETRY ON PENETRATION SPREAD AND STRUCTURE OF A LIQUID JET INJECTED NORMAL TO A SUPERSONIC AIR STREAM

P. Joshi, A. Jakubowski, and J. Schetz Sep. 1973 142 p refs
(Grant AF-AFOSR-1875-70; AF Proj. 9711)
(AD-775998; VPI-Aero-008; AFOSR-74-0149TR) Avail: NTIS CSCL 20/4

The effect of injector geometry on the penetration, width and structure of a liquid jet injected normal to a supersonic air stream was experimentally studied. Circular, rectangular ahd square injectors of four different port areas were tested over a wide range of jet/free stream dynamic pressure ratio. For the rectangular injectors, both aligned and transverse configurations with respect to the cross flow were studied. The penetration and width data were obtained from streak photographs and the jet structure was examined using spark photomicrographs. Correlations for jet penetration and width were developed by analyzing the jet as a blunt body in supersonic flow. The effect of injector geometry was taken into account by an experimentally obtained factor. (Modified author abstract) GRA

N74-22664 Naval Ship Research and Development Center, Washington, D.C. Hydroacoustic Branch.
AN EXPERIMENTAL STUDY OF THE INTERMITTENT WALL PRESSURE BURSTS DURING NATURAL TRANSITION OF A LAMINAR BOUNDARY LAYER
Fred C. DeMetz and Mario J. Casarella *In* AGARD Noise Mech. Mar. 1974 18 p refs (For availability see N74-22640 14-02)

N74-22666 Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
INVESTIGATION OF THE INSTANTANEOUS STRUCTURE OF THE WALL PRESSURE UNDER A TURBULENT BOUNDARY LAYER FLOW
R. Emmerling, G. E. A. Meier, and A. Dinkelacker *In* AGARD Noise Mech. Mar. 1974 12 p refs (For availability see N74-22640 14-02)

N74-22669 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Berlin (West Germany). Inst. fuer Turbulenzforschung.
RESOLUTION OF TURBULENT JET PRESSURE INTO AZIMUTHAL COMPONENTS
H. V. Fuchs *In* AGARD Noise Mech. Mar. 1974 10 p refs (For availability see N74-22640 14-02)

N74-22670 London Univ. (England). Dept. of Aeronautical Engineering.
SOME EXPERIMENTAL RESULTS ON EXCESS NOISE
A. D. Young *In* AGARD Noise Mech. Mar. 1974 5 p refs (For availability see N74-22640 14-02)

N74-23484 National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.
AN APPROXIMATE HYDRODYNAMIC CODE
P. Huculak *In* Natl. Res. Council of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Est., 1 Jan. - 31 Mar. 1974 31 Mar. 1974 p 1-10 refs (For availability see N74-23483 14-34)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-22944 Wisconsin Univ., Madison.
USE OF AERIAL PHOTOGRAPHY TO QUANTITATIVELY ESTIMATE WATER QUALITY PARAMETERS IN SURFACE WATER MIXING ZONES Ph.D. Thesis
Thomas Martin Lillesand 1973 135 p
Avail: Univ. Microfilms Order No. 73-30329

The extent, site dependence and temporal dynamics of mixing zones have made it impractical to monitor them solely on the basis of conventionally collected field data. A method has been developed to quantitatively delineate waste concentrations throughout the mixing zone on the basis of densitometric measurements extracted from aerial photography. Simultaneously-acquired color infrared photography and suspended solids water samples have been used to quantitatively delineate the mixing zone resulting from the discharge of a paper mill effluent at the Kimberly-Clark Paper Mill located on the lower Fox River at Kemberly, Wisconsin. The results and experiences have indicated that photographic photometry, when predicated on a limited amount of ground sampling, can be used to measure and delineate mixing zone waste distributions as reliably and in more detail than conventional surface measuring techniques. Dissert. Abstr.

N74-22945+ Institut d'Aeronomie Spatiale de Belgique, Brussels.
BIBLIOGRAPHY: SECTION 11-A, 1973. TERRESTRIAL SPACE, PART 1 [BIBLIOGRAPHIE: FASCICULE 11-A, 1973. 1: ESPACE TERRESTRE]
1973 161 p refs In FRENCH
Avail: NTIS HC $11.25

A bibliography on terrestrial space is reported. Data cover auroras and airglow, solar and cosmic radiation, and atmospheric structure. Data are also given on meteorology, geomagnetism, and atmospheric chemistry. E.H.W.

N74-22946+ Institut d'Aeronomie Spatiale de Belgique, Brussels.
BIBLIOGRAPHY: SECTION 11-B, 1973. TERRESTRIAL SPACE, PART 1 [BIBLIOGRAPHIE: FASCICULE 11-B 1973. 1: ESPACE TERRESTRE]
1973 127 p refs In FRENCH
Avail: NTIS HC $9.50

For abstract, see N74-22945.

N74-22947+ Institut d'Aeronomie Spatiale de Belgique, Brussels.
BIBLIOGRAPHY: SECTION 10, 1973. INTERPLANETARY SPACE, PART 2 [BIBLIOGRAPHIE: FASCICULE 10, 1973 II: ESPACE INTERPLANETAIRE]
1973 167 p refs In FRENCH
Avail: NTIS HC $11.50

An interplanetary space bibliography including data on the planets, comets and meteors, cosmic radiation, and gravitation is presented. Special attention was given to the Moon, Mars, and Venus. The structure of interplanetary space is also discussed. E.H.W.

N74-22948*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Mar. 1974
Joe R. Eagleman, Ernest C. Pogge, Richard K. Moore, Principal Investigators, Norman Hardy, Wen Lin, and Larry League Mar. 1974 16 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13273)
(E74-10471; NASA-CR-136872) Avail: NTIS HC $4.00 CSCL 08H

The author had identified the following significant results. Soil moisture and precipitation variations were not detectable as tonal variations on the S190A IR B and W photography. Some light tonal areas contained high precipitation .83 inches and high moisture content 21.1% while other light tonal areas contained only .02 inches precipitation and as little as 0.7% moisture. Similar variations were observed in dark tonal areas. This inconsistancy may be caused by a lapse of 3 to 4 days from the time precipitation occurred until the photographs were taken and the fact that in the first inch of soil the measured soil moisture was generally less than 5.0%. For overall tonal contrast, the aerial color, color IR and aerial B and W appear to be the best. Cities stand out from the landscape best in the aerial color and color IR, however, to see major street patterns a combination of the two aerial B and W bands and the two IR B and W bands may be desirable. For mapping roads it is best use all 6 bands. For lake detection, the IR B and W bands would be the best but for streams the aerial B and W band would be better. The aerial color, color IR, and the two IR B and W bands are best for distinguishing cultivated and non-cultivated areas, whereas the two aerial B and W bands are better for seeing local relief. Clouds may be best seen in the aerial color and color IR bands.

N74-22949*# California State Office of Science and Technology, Sacramento.
USE OF ERTS-A, SKYLAB, AND SUPPORTING AIRCRAFT TO ENHANCE RESOURCE MANAGEMENT Final Report
A. Earl Davis, David H. Adams, Barry Brown, Edward D. Ehlers, Gilbert W. Fraga, W. Ward Henderson, John W. Heslep, Gordon F. Snow, and Paul L. Clifton, Principal Investigators 30 Nov. 1973 17 p ERTS
(Contract NAS5-21832)
(E74-10498; NASA-CR-136903) Avail: NTIS HC $4.00 CSCL 08B

There are no author-identified significant results in this report.

N74-22950*# Geological Survey, Denver, Colo.
REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Apr. 1974
Kenneth Watson, Principal Investigator and H. A. Pohn Apr. 1974 2 p ref EREP
(NASA Order T-6555-B)
(E74-10501; NASA-CR-136906) Avail: NTIS HC $4.00 CSCL 08E

There are no author-identified significant results in this report.

N74-22951*# Environmental Research and Technology, Inc., Lexington, Mass.
THE APPLICATION OF ERTS IMAGERY TO MONITORING ARCTIC SEA ICE Final Report, 28 Jun. 1972 - 31 Dec. 1973
James C. Barnes, Principal Investigator and Clinton J. Bowley Feb. 1974 103 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21802)
(E74-10502; NASA-CR-136907; ERT-P-408-F) Avail: NTIS HC $8.25 CSCL 08L

The author has identified the following significant results. Because of the effect of sea ice on the heat balance of the Arctic and because of the expanding economic interest in arctic oil and minerals, extensive monitoring and further study of sea ice is required. The application of ERTS data for mapping ice is evaluated for several arctic areas, including the Bering Sea, the eastern Beaufort Sea, parts of the Canadian Archipelago, and the Greenland Sea. Interpretive techniques are discussed, and the scales and types of ice features that can be detected are described. For the Bering Sea, a sample of ERTS-1 imagery is compared with visual ice reports and aerial photography from the NASA CV-990 aircraft. The results of the investigation demonstrate that ERTS-1 imagery has substantial practical application for monitoring arctic sea ice. Ice features as small as 80-100 m in width can be detected, and the combined use of the visible and near-IR imagery is a powerful tool for identifying ice types. Sequential ERTS-1 observations at high latitudes enable ice deformations and movements to be mapped. Ice conditions in the Bering Sea during early March depicted in ERTS-1 images are in close agreement with aerial ice observations and photographs.

N74-22952*# Earth Satellite Corp., Washington, D.C.
APPLICATION OF ERTS-1 DATA TO THE HARVEST MODEL OF THE US MENHADEN FISHERY Final Report
Paul M. Maughan, Principal Investigator and Allan D. Marmelstein Mar. 1974 56 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21743)
(E74-10504; NASA-CR-138090) Avail: NTIS HC $6.00 CSCL 08A

The author has identified the following significant results. The project was conducted in Mississippi Sound in the north-central Gulf of Mexico. It utilized conventional surface data, obtained from fishing and other vessels, as well as aircraft and spacecraft remote data. A relationship was established between surface measured water transparency, temperature and salinity, and commercial fish-stock availability. Numerical models of the relationships were derived. A multiple regression was performed relating ERTS-1 MSS Band 5 image density to measured transparency and water depth. It is concluded that remotely acquired data can play a role in harvest decisions of commercial fisheries.

N74-22953*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
SKYLAB S192 DATA EVALUATION: COMPARISONS WITH ERTS-1 RESULTS
C. Y. Chang Jan. 1974 58 p ref Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-12200)
(E74-10506; NASA-CR-134246; LEC-1711) Avail: NTIS HC $6.00 CSCL 05B

The author has identified the following significant results. The Skylab S192 data was evaluated by: (1) comparing the classification results using S192 and ERTS-1 data over the Holt County, Nebraska agricultural study area, and (2) investigating the impact of signal-to-noise ratio on classification accuracies using registered S192 and ERTS-1 data. Results indicate: (1) The classification accuracy obtained on S192 data using its best subset of four bands can be expected to be as high as that on ERTS-1 data. (2) When a subset of four S192 bands that are spectrally similar to the ERTS-1 bands was used for classification, an obvious deterioration in the classification accuracy was observed with respect to the ERTS-1 results. (3) The thermal bands 13 and 14 as well as the near IR bands were found to be relatively important in the classification of agricultural data. Although bands 11 and 12 were highly correlated, both were invariably included in the best subsets of the band sizes, four and beyond, according to the divergence criterion. (4) The differentiation of corn from popcorn was difficult on both S192 and ERTS-1 data acquired at an early summer date. (5) The results on both sets of data indicate that it was relatively easy to differentiate grass from any other class.

N74-22954*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC INFORMATION FROM SATELLITE IMAGES
Keenan Lee, Daniel H. Knepper, Principal Investigators, and Don L. Sawatzky 27 Mar. 1974 39 p refs Presented at the 3d Ann. Remote Sensing of Earth Resources Conf., Tullahoma, Tenn., 26 Mar. 1974 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS and EREP
(Contracts NAS9-13394; NAS5-21778; Grant NGL-06-001-015)
(E74-10507; NASA-CR-138230; Rept-74-3) Avail: NTIS HC $5.00 CSCL 08G

The author has identified the following significant results. Extracting geologic information from ERTS and Skylab/EREP images is best done by a geologist trained in photointerpretation. The information is at a regional scale, and three basic types are available: rock and soil, geologic structures, and landforms. Discrimination between alluvium and sedimentary or crystalline bedrock, and between units in thick sedimentary sequences is best, primarily because of topographic expression and vegetation differences. Discrimination between crystalline rock types is poor. Folds and fractures are the best displayed geologic features. They are recognizable by topographic expression, drainage patterns, and rock or vegetation tonal patterns. Landforms are easily discriminated by their familar shapes and patterns. It is possible to optimize the scale, format, spectral bands, conditions of acquisition, and sensor systems for best geologic interpretation. Several examples demonstrate the applicability of satellite images to tectonic analysis and petroleum and mineral exploration.

N74-22955*# Colorado School of Mines, Golden. Dept. of Geology.
APPLICABILITY OF REMOTE SENSOR DATA TO GEOLOGIC ANALYSIS OF THE BONANZA TEST SITE COLORADO

Semiannual Progress Report, 1 Oct. 1973 - 31 Mar. 1974
Daniel H. Knepper, Keenan Lee, Principal Investigators, R. W. Butler, J. C. Fisher, and D. Huntley May 1974 30 p refs
ERTS
(Grant NGL-06-001-015)
(E74-10508; NASA-CR-138231; Rept-74-1) Avail: NTIS HC $4.50 CSCL 08G

There are no author-identified significant results in this report.

N74-22956*# Colorado School of Mines, Golden. Dept. of Geology.
NEW USES OF SHADOW ENHANCEMENT
Keenan Lee, Principal Investigator and Don L. Sawatzky 27 Mar. 1974 22 p ref Presented at the 3d Ann. Remote Sensing of Earth Resources Conf., Tullahoma, Tenn., 25 Mar. 1974 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13394; Grant NGL-06-001-015)
(E74-10509; NASA-CR-138232; Rept-74-5) Avail: NTIS HC $4.25 CSCL 14E

The author has identified the following significant results. Shadow enhancement of topographic linears in photographic or scanner images is a valuable tool for interpretation of geologic structures. Whether linears will be enhanced or subdued depends on sun angle and azimuth. The relationship of the sun's attitude to topographic slopes determines which trends are available for interpretation in existing imagery, and it can be used to select the time of day, surface properties, and film and filter characteristics in planning aircraft flights or satellite orbital passes. The technique of selective shadow enhancement can be applied to all photographic or imaging experiments, but its best for snow-covered scenes, side-looking radar images, and painted relief models.

N74-22957*# Colorado School of Mines, Golden. Dept. of Geology.
AN EVALUATION OF MULTIBAND PHOTOGRAPHY FOR ROCK DISCRIMINATION
Keenan Lee, Principal Investigator and Gary L. Raines 27 Mar. 1974 38 p refs Presented at the 3d Ann. Remote Sensing of Earth Resources Conf., Tullahoma, Tenn., 26 Mar. 1974 ERTS
(Grants NGL-06-001-015; DA-ARO(D)-31-124-71-G101; DA-ARO(D)-31-124-73-G88)
(E74-10510; NASA-CR-138233; Rept-74-4) Avail: NTIS HC $5.00 CSCL 14E

The author has identified the following significant results. With the advent of ERTS and Skylab satellites, multiband imagery and photography have become readily available to geologists. The ability of multiband photography to discriminate sedimentary rocks was examined. More than 8600 in situ measurements of band reflectance of the sedimentary rocks of the Front Range, Colorado, were acquired. Statistical analysis of these measurements showed that: (1) measurements from one site can be used at another site 100 miles away; (2) there is basically only one spectral reflectance curve for these rocks, with constant amplitude differences between the curves; and (3) the natural variation is so large that at least 150 measurements per formation are required to select best filters. These conclusions are supported by subjective tests with aerial multiband photography. The designed multiband photography concept for rock discrimination is not a practical method of improving sedimentary rock discrimination capabilities.

N74-22958*# Lockheed Missiles and Space Co., Palo Alto, Calif.
MAGNETOSPHERIC CONVECTION AND THE HIGH LATITUDE F2 IONOSPHERE
W. C. Knudsen Sep. 1973 49 p refs
(Contract NASw-2550)
(NASA-CR-138248) Avail: NTIS HC $5.50 CSCL 04A

Behavior of the polar ionospheric F-layer as it is convected through the cleft, over the polar cap, and through the night side F-layer trough zone was investigated. Passage through the cleft adds of the order of 200,000 ions/cu cm in the vicinity of the F 2 peak and redistributes the ionization above approximately 400 km altitude to conform with an increased electron temperature. The F-layer is also raised of the order of 20 km in altitude by the convection electric field. In the night soft electron precipitation zone, the layer is lowered in altitude by the convection electric field, and then decays, primarily by chemical recombination, as it convects equatorward and around the dawn side of the earth. In the absence of ionization sources, decay by factors of the order of 100 to 1000 occur prior to entry into the sunlit hemisphere, thus forming the F-layer night trough. Author

N74-22959*# Hawaii Univ., Honolulu. Dept. of Botany.
LEAD: ASPECTS OF ITS ECOLOGY AND ENVIRONMENTAL TOXICITY Semiannual Report
S. M. Siegel May 1973 61 p refs
(Grant NGL-12-001-042)
(NASA-CR-138385; Paper-32) Avail: NTIS HC $6.25 CSCL 06F

An analysis of lead toxicity in the Hawaiian environment was conducted. It was determined that lead enters the environment as an industrial contaminant resulting from the combustion of leaded gasoline. The amount of lead absorbed by the plants in various parts of the Hawaiian Islands is reported. The disposition of lead in the sediments of canals and yacht basins was investigated. The methods for conducting the surveys of lead conent are described. Possible consequences of continued environmental pollution by burning leaded gasoline are discussed. P.N.F.

N74-22960*# Hawaii Univ., Honolulu. Dept. of Botany.
MERCURY: ASPECTS OF ITS ECOLOGY AND ENVIRONMENTAL TOXICITY Semiannual Report
S. M. Siegel Jun. 1973 59 p refs
(Grant NGL-12-001-042)
(NASA-CR-138381; Paper-33) Avail: NTIS HC $6.00 CSCL 06F

A study was conducted to determine the effects of mercury pollution on the environment. The possible sources of mercury contamination in sea water are identified. The effects of mercury on food sources, as represented by swordfish, are analyzed. The physiological effects of varying concentrations of mercury are reported. Emphasis is placed on the situation existing in the Hawaiian Islands. P.N.F.

N74-22961*# Martin Marietta Corp., Denver, Colo.
SKYLAB EARTH RESOURCE EXPERIMENT PACKAGE CRITICAL DESIGN REVIEW
[1973] 136 p Sponsored by NASA
(NASA-CR-138380) Avail: NTIS HC $10.00 CSCL 14B

An outline of the conference for reviewing the design of the EREP is presented. Systems design for review include: tape recorder, support equipment, view finder/tracking, support hardware, and control and display panel. F.O.S.

N74-22962*# Michigan Univ., Ann Arbor. School of Natural Resources.
REMOTE SENSING OF CHANGES IN MORPHOLOGY AND PHYSIOLOGY OF TREES UNDER STRESS Remote Sensing Applications in Forestry. Final Report, 1 Oct. 1971 - 31 Dec. 1972
Charles F. Olson, Jr. Berkeley, Calif. Calif. Univ. Forestry Remote Sensing Lab. 30 Sep. 1972 42 p refs Prepared for Calif. Univ., Berkeley. Forestry Remote Sensing Lab. in cooperation with Dept. of Agric. Forest Serv.
(NASA Order R-09-038-002)
(NASA-CR-138392) Avail: NTIS HC $5.25 CSCL 02F

Previsual detection of Fomes annosus in pine plantations was studied. Detailed analyses of photographic imagery obtained over the Ann Arbor Test Site during 1969 and 1970 reveal that the Ektachrome Infrared film was superior to Ektachrome Aerographic, Infrared Aerographic, or Plus-X Aerographic films for detecting Fomes annosus damage. Of far more significance in controlling the accuracy of damage detection, however, was the experience of the photo interpreter. Ratio-processing of multispectral scanner data was investigated with data collected in June of 1970 and in June of 1972. Ratioing of the 1.5-1.8 and 1.0-1.4 micrometer channels gave good results at detecting openinggs in the crown canopy and adjacent infected trees. Combined level slicing of the 1.5-1.8 micrometer channel and the 1.5-1.8 to 1.0-1.4 micrometer ratio permitted separation and recognition of forest litter in the openings and stressed trees adjacent ot the openings. Author

N74-22963*# Ohio State Univ. Research Foundation, Columbus. Dept. of Geodetic Science.

GLOBAL SATELLITE TRIANGULATION AND TRILATERATION FOR THE NATIONAL GEODETIC SATELLITE PROGRAM (SOLUTIONS WN 12, 14 AND 16)

Ivan I. Mueller, M. Kumar, J. P. Reilly, N. Saxena, and T. Soler May 1973 266 p refs
(Grant NGR-36-008-093; OSURF Proj. 2514)
(NASA-CR-138252; Rept-199) Avail: NTIS HC $16.50 CSCL 08E

A multi-year study and analysis of data from satellites launched specifically for geodetic purposes and from other satellites useful in geodetic studies was conducted. The program of work included theoretical studies and analysis for the geometric determination of station positions derived from photographic observations of both passive and active satellites and from range observations. The current status of data analysis, processing and results are examined. Author

N74-22964*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

INTERHEMISPHERIC COMPARISON OF ATMOSPHERIC CIRCULATION FEATURES AS EVALUATED FROM NIMBUS SATELLITE DATA Semiannual Report, 1 Jul. - 31 Dec. 1973

E. R. Reiter and Robert F. Adler 31 Dec. 1973 39 p refs
(Grant NGR-06-002-098)
(NASA-CR-138202) Avail: NTIS HC $5.00 CSCL 04A

Atmospheric structure derived from satellite, multichannel radiance data is used to calculate zonally averaged vertical motions in the wintertime stratosphere of both hemispheres using a heat budget approach. The Northern Hemisphere calculations based on the satellite data are shown to compare favorably with a computation carried out with conventional data, and with results of previous studies. The mean Southern Hemisphere pattern for the month of July 1969 indicates a two-celled structure with the high latitude cell centered at 60-65S. The axis of sinking motion in this cell is at approximately 50S, while the rising motion is centered at 70S. Thus the Antarctic stratospheric jet stream is associated with an indirect cell. Two individual ten-day periods from July 1969 are examined to compare the mean meridional circulation and eddy heat flux patterns in the Southern Hemisphere during a minor midwinter warming and during a quiet period. Author

N74-22965*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

CRYSTAL MOTION MEASUREMENT BY MEANS OF SATELLITE TECHNIQUES

Joseph W. Siry May 1973 38 p refs Presented at the Am. Geophys. Union 3d GEOP Res. Conf., Columbus, Ohio, 31 May - 1 Jun. 1973
(NASA-TM-X-70632; X-590-73-273) Avail: NTIS HC $5.00 CSCL 08E

A system for monitoring precursory crustal motions is presented. It involves a set of automated corner reflector stations tracked by means of a laser operating in the Geopause satellite. It is possible to range some three times during every Geopause pass to each of the sites in such an ensemble, weather permitting. One centimeter range data gathered during a quarter of a year can yield position component accuracies of the order of a couple of centimeters. A laser beam of a tenth of a milliradian in diameter would, illuminate a single station in such an array. A broader beam would generate reflections from several sites, yielding overlapping data. A chain or pattern of such overlapping regions can strengthen the solution for site positions. Pressure, temperature and humidity gauges can provide refraction correction data. Turnaround transponders interrogated by the Geopause radio tracking system can furnish corresponding data in excessively cloudy regions. Author

N74-22966*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ROCKET OBSERVATION OF SOFT ENERGETIC PARTICLES AT THE MAGNETIC EQUATOR

Richard A. Goldberg May 1974 21 p refs Submitted for publication
(NASA-TM-X-70646; X-912-74-128) Avail: NTIS HC $4.25 CSCL 03B

Results from a rocket-borne ion mass spectrometer flown near the magnetic equator at 0108 LMT, March 10, 1970, exhibit an unusual background current above 200 km. This current is observed to increase 3.5 orders of magnitude between 200 and 260 km before maximizing to a fixed value from 260 km to the 295 km apogee of the flight. Properties of the background combined with laboratory measurements have permitted probable identification of the background source as 2-20 keV electrons or protons. Maximum electron fluxes have been estimated to be of the order 10 to the 10th power particles/sq cm-sec-ster in accord with ISIS-1 satellite measurements at higher altitudes. The background was not observed on an earlier flight at 1938 LMT, suggesting the particles to be trapped in a blet which drifted below 300 km between the two flights. The low altitude penetration of these fluxes may have been related to the great magnetic storm of March 8. Simultaneous measurements of the thermal ion distribution are compared with these results and qualitatively suggest that the soft energetic particles are responsible for an observed O2(+) and NO(+) enhancement. Author

N74-22967*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EXPLORER 45 (S 3-A) OBSERVATIONS OF THE MAGNETOSPHERE AND MAGNETOPAUSE DURING THE 4-5 AUGUST 1972, MAGNETIC STORM PERIOD

R. A. Hoffman, L. J. Cahill, Jr. (Minnesota Univ.), R. R. Anderson (Iowa Univ.), N. C. Maynard, P. H. Smith, T. A. Fritz (NOAA, Boulder, Colo.)07(NOAA, Boulder, Colo.), D. J. Williams, A. Konradi (NASA. Johnson Space Center), and D. A. Gurnett (Iowa Univ.) Apr. 1974 37 p refs Submitted for publication
(NASA-TM-X-70644; X-621-74-114) Avail: NTIS HC $5.00

The Explorer 45 satellite performed extensive field and particle measurements in the heart of the magnetosphere during the double magnetic storm period of August 4-5, 1972. Both ground level magnetic records and the magnetic field deformations measured along the orbit by the satellite indicated the existence of only a moderate ring current. This was confirmed by the measurements of the total proton energy density less than those observed during the December 1971 and June 1972 magnetic storms. The plasmapause in the noon quadrant was eroded continuously from the onset of the first storm at the beginning of August 4 to an altitude below L = 2.07 at about 18 hours on August 5. During the orbit containing the second sudden commencement a large amount of low frequency electric and magnetic field noise was encountered throughout the entire orbit. A noteworthy observation during this orbit was the contraction of the magnetopause to distances inside the satellite at L = 5.2. Author

N74-22968*# City Coll. of the City of New York.

EFFECTS OF A TRANSIENT SEA SURFACE TEMPERATURE ANOMALY ON THE ENERGETICS OF THE MINTZ-ARAKAWA MODEL ATMOSPHERE

Shu Hsien Chow Apr. 1974 90 p refs Prepared in cooperation with New York Univ., N. Y.
(Grants NGR-33-016-174; NGR-33-013-086)
(NASA-CR-137991) Avail: NTIS HC $7.50 CSCL 04A

The possible response of the atmosphere, as simulated by the two level Mintz-Arakawa global general circulation model, to a transient North Pacific sea surface temperature anomaly is investigated in terms of the energetics both in the spatial and wave number domains. Results indicate that the transient SST variations of reasonable magnitude in the North Pacific Ocean can induce a disturbing effect on the global energetics both in the spatial and wave number domains. The ability of the two level Mintz-Arakawa model to simulate the atmospheric energetics is also examined. Except in the tropics, the model exhibits a reasonable and realistic energy budget. Author

N74-22969*# Stanford Univ., Calif. School of Engineering.

WILDLAND FIRE MANAGEMENT. VOLUME 1: PREVENTION METHODS AND ANALYSIS Final Report

Stein Weissenberger, ed. 1973 218 p refs
(Grant NGT-05-020-409)
(NASA-CR-138399) Avail: NTIS HC $14.00 CSCL 08F

A systems engineering approach is reported for the problem of reducing the number and severity of California's wildlife fires. Prevention methodologies are reviewed and cost benefit models are developed for making preignition decisions. Author

N74-22970*# Stanford Univ., Calif. School of Engineering.

WILDLAND FIRE MANAGEMENT. VOLUME 2: WILDLAND FIRE CONTROL 1985-1995 Final Report

David R. Saveker, ed. 1973 193 p refs
(Grant NGT-05-020-409)
(NASA-CR-138400) Avail: NTIS HC $12.75 CSCL 08F

The preliminary design of a satellite plus computer earth resources information system is proposed for potential uses in fire prevention and control in the wildland fire community. Suggested are satellite characteristics, sensor characteristics, discrimination algorithms, data communication techniques, data processing requirements, display characteristics, and costs in achieving the integrated wildland fire information system. Author

N74-22971*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

RESULTS OF THE US CONTRIBUTION TO THE JOINT US/USSR BERING SEA EXPERIMENT

W. J. Campbell, T. C. Chang, M. G. Fowler, P. Gloersen, P. M. Kuhn, R. O. Ramseier, D. B. Ross, G. Stambach, W. J. Webster, Jr., and T. T. Wilheit May 1974 197 p refs
(NASA-TM-X-70648; X-910-74-141) Avail: NTIS HC $13.00 CSCL 08C

The atmospheric circulation which occurred during the Bering Sea Experiment, 15 February to 10 March 1973, in and around the experiment area is analyzed and related to the macroscale morphology and dynamics of the sea ice cover. The ice cover was very complex in structure, being made up of five ice types, and underwent strong dynamic activity. Synoptic analyses show that an optimum variety of weather situations occurred during the experiment: an initial strong anticyclonic period (6 days), followed by a period of strong cyclonic activity (6 days), followed by weak anticyclonic activity (3 days), and finally a period of weak cyclonic activity (4 days). The data of the mesoscale test areas observed on the four sea ice option flights, and ship weather, and drift data give a detailed description of mesoscale ice dynamics which correlates well with the macroscale view: anticyclonic activity advects the ice southward with strong ice divergence and a regular lead and polynya pattern; cyclonic activity advects the ice northward with ice convergence, or slight divergence, and a random lead and polynya pattern. Author

N74-22972*# Geological Survey, Reston, Va.

REMOTE-SENSING STUDIES OF HYDROLOGIC ENVIRONMENTS IN THE LOWER RARITAN RIVER SYSTEM, NEW JERSEY

Peter W. Anderson and Seymour Subitzky 1973 16 p refs
Sponsored by NASA Original contains color illustrations
(NASA-CR-138398) Avail: NTIS HC $4.00 CSCL 08H

A series of remote sensing experiments were conducted in January and November 1968. The airborne multisensor missions included photographic and thermal-infrared sensors operated over a single site at a time when streamflow and water temperature observations were being made on the ground. Remote sensing data show: (1) effect of thermal waste water discharges on stream temperatures, (2) cross-channel variations in thermal characteristics due to waste water discharge, channel characteristics, and tidal currents, (3) influence of flow rates on dispersion, (4) patterns and distribution of ice cover, and (5) movement of sediment loads. Author

N74-22973*# Mississippi State Univ., State College.

APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS Semiannual Progress Report, 1 Nov. 1973 - 30 Apr. 1974

C. W. Bouchillon, W. F. Miller, H. Landphair, and V. L. Zitta 30 Apr. 1974 19 p
(Grant NGL-25-001-054)
(NASA-CR-138394; SAPR-1) Avail: NTIS HC $4.00 CSCL 08B

The use of remote sensing techniques to help the state of Mississippi recognize and solve its environmental, resource, and socio-economic problems through inventory, analysis, and monitoring is suggested. Author

N74-22974*# California Univ., Berkeley. Space Sciences Lab.

UCB CURRENT DETECTOR EXPERIMENT ON SWEDISH AURORAL PAYLOADS Final Report, 1 Jan. 1972 - 30 Sep. 1973

Forrest Mozer 30 Apr. 1974 72 p refs
(Grant NGR-05-003-445)
(NASA-CR-138387; SSL-Ser-15-Issue-22) Avail: NTIS HC $6.75 CSCL 04A

A split Langmuir probe has been developed to make in situ measurements of ionospheric current density and plasma bulk flow. The probe consists of two conducting elements that are separated by a thin insulator that shield each other over a 2 pi solid angle, and that are simultaneously swept from negative to positive with respect to the plasma. By measuring the current to each plate and the difference current between plates, information is obtained on the plasma's current density, bulk flow, electron temperature, and density. The instrument was successfully flown twice on sounding rockets into auroral events. Measurement data indicate that the total auroral current configuration is composed of several alternating east and west electrojets associated with several alternating up and down Birkeland currents. Author

N74-22975*# Scientific Translation Service, Santa Barbara, Calif.

PETROLOGIC INVESTIGATIONS IN THE RIES: VARIEGATED BRECCIA

Wolf V. Engelhardt, Dieter Stoeffler, and Werner Schneider Washington NASA May 1974 19 p Transl. into ENGLISH from Geol. Bavarica (Munich), no. 61, 1969 p 276-284
(Contract NASw-2483)
(NASA-TT-F-15602) Avail: NTIS HC $4.00 CSCL 08G

The variegated breccia appears to represent an inversion of the original primary deposit, based on the fact that lower stratigraphic layers appear more frequently in the upper parts of the breccia. Portions of the breccia from the crater are from zones in which the maximum shock wave pressure did not exceed 500 kbar. Author

N74-22976*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.

REMOTE SENSING AS AN AID FOR MARSH MANAGEMENT

James G. Ragan and John H. Green (Nicholls State Univ.) Dec. 1973 33 p refs
(Grant NGL-19-001-105)
(NASA-CR-138256; AOP-4) Avail: NTIS HC $4.75 CSCL 08H

NASA aerial photography, primarily color infrared and color positive transparencies, is used in a study of marsh management practices and in comparing managed and unmanaged marsh areas. Weir locations for tidal control are recommended. Author

N74-22977 National Oceanic and Atmospheric Administration, Boulder, Colo.

AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE (11) FOR 1968

Joe Haskell Allen, Carl C. Abston, and Leslie D. Morris Oct. 1973 148 p refs
(UAG-29) Avail: NTIS MF $1.45; National Climatic Center, Federal Building, Asheville, N. C. 28801. Attn: Publications HC $0.75 CSCL 04A

The auroral electrojet index (AE) is discussed, and a description is given of the derivation of 11-station 2.5-min AE indices for 1968. Tables are given of hourly average indices for each day of the year, of the stations making the main contribution to the hourly indices, and of the average monthly quiet-time level of horizontal field at each magnetic observatory. Graphs of the index variations are included for each day. Author

N74-22978# Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia).

DIVISION OF ATMOSPHERIC PHYSICS Annual Report, 1972-1973
1973 37 p refs
Avail: NTIS HC $5.00

Research in atmospheric chemistry is reported. Data cover dynamic and synoptic meteorology, geophysical fluid dynamics, atmospheric and terrestrial radiation, micrometeorology, and atmospheric monitoring. Upper atmospheric data and agricultural meteorology are also included. E.H.W.

N74-22979# Suomalainen Tiedeakatemia, Helsinki (Finland).
MAGNETIC OBSERVATION RESULTS FROM THE SODANKYLA OBSERVATORY FOR THE YEAR 1971 [ERGEBNISSE DER MAGNETISCHEN BEOBACHTUNGEN DES OBSERVATORIUMS ZU SODANKYLAE IM JAHRE 1971]
Eero Kataja 1973 33 p In GERMAN
(ISBN-951-41-0141-3) Avail: NTIS HC $4.75

The results of magnetic surveys made during the calendar year 1971 at the Sodankyla observatory in Finland are tabulated. The characteristics of the test equipment used in the observations are described. The monthly and yearly averages of the observations are calculated. Calculations for the X, Y, and 1 components, as well as the total intensity, of the magnetic field are shown. P.N.F.

N74-22980# European Space Research Organization, Paris (France).
EUROPEAN SOUNDING-ROCKET AND RELATED RESEARCH AT HIGH LATITUDES
Nov. 1973 315 p refs Partly in ENGLISH and partly in FRENCH; ENGLISH summary Proc. of a Symp. held at Spaatind, Norway, 2-6 Apr. 1973
(ESRO-SP-97) Avail: NTIS HC $18.75

European cooperative sounding rocket research centered on ionospheric-magnetospheric interactions and auroral particle precipitation. For individual titles, see N74-22981 through N74-23017.

N74-22981 Kiruna Geophysical Observatory (Sweden).
SURVEY OF THE PRESENT STATE OF IONOSPHERIC AND MAGNETOSPHERIC PHYSICS
Bengt Hultqvist *In* ESRO European Sounding-Rocket and Related Res. At High Latitudes Nov. 1973 p 3-27 refs (For availability see N74-22980 14-13)

Aspects of current developments in magnetospheric research are discussed including the occurence of cold plasma in the magnetosphere the interaction of the solar wind and the magnetosphere the distribution function for a high temperature plasma, the distribution of large scale electric fields, in the magnetosphere, electrical currents, and substorms and other collective plasma effects. (ESRO)

N74-22982 Technische Universitaet, Brunswick (West Germany). Inst. fuer Geophysik und Meteorologie.
GERMANY'S PLANS AND PROGRAMMES FOR HIGH-LATITUDE RESEARCH
B. Theile *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 29-30 (For availability see N74-22980 14-13)

Two of Germany's three high altitude sounding rocket programs are outlined. The scientific objectives of the aeronomy and the international magnetospheric study programs are given, together with the parameters to be measured, the instrumentation, ground observations, payloads, and launch windows. ESRO

N74-22983 Swedish Board for Space Activities, Stockholm.
THE SWEDISH SOUNDING-ROCKET PROGRAMME
E. A. Brunberg *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 31-39 (For availability see N74-22980 14-13)

A short description is given of the projects to be carried out and under research within the framework of the Swedish sounding rocket program. The projects cover three main areas of space research - the photochemistry of the mesosphere and lower ionosphere, magnetosphere and ionospheric physics, and micrometeorite flux in space. The scientific objective of each project and the participating agencies are given. ESRO

N74-22984 Radio and Space Research Station, Slough (England).
THE BRITISH SOUNDING ROCKET PROGRAMMES IN RELATION TO THE ESRANGE SPECIAL PROJECT
G. W. Eastwood *In* ESRO European Sounding Rocket and Related Res. at High Latitudes Nov. 1973 p 41-42 (For availability see N74-22980 14-13)

Brief details are given of the British sounding rocket programs, including the various sounding rockets used, scientific aims and launch ranges. ESRO

N74-22985 Science Research Council, London (England).
THE BRITISH HIGH-LATITUDE SOUNDING-ROCKET PROGRAMME, 1969 - 1973
E. W. V. Acton *In* ESRO European Sounding Rocket and Related Res. at High Latitudes Nov. 1973 p 43-51 refs (For availability see N74-22980 14-13)

Details are given of the Petrel and Skua sounding rockets together with information on telemetry, tracking, and launch preparations. A survey of experiments carried out at high latitudes is given together with future projects. ESRO

N74-22986 Max-Planck-Institut fuer Extraterrestrische Physik, Munich (West Germany).
SOUNDING-ROCKET PAYLOADS DEVELOPED AT THE MAX-PLANCK-INSTITUT FUER EXTRATERRESTRISCHE PHYSIK FROM 1970 - 1973 FOR RESEARCH AT HIGH LATITUDES c31
J. E. Stoecker *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 53-59 (For availability see N74-22980 14-13)

The payloads of Nike-Tomahawk sounding rocket experiments are described with emphasis on the sequence of actions during flight. Four of the technical systems developed for the payloads are reported in detail. These are the electronic and power supply unit, the ignition and ejection mechanism for the shaped charges, the impulse generator for the horizontal shift, and the separation system. ESRO

N74-22987 Oslo Univ. (Norway). Inst. of Cosmic Physics.
SMALL-SCALE IRREGULARITIES IN THE AURORAL E-REGION
A. Egeland and J. A. Holtet *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 61-67 refs (For availability see N74-22980 14-13)

In-situ measurements of small scale irregularities in the auroral E region are discussed. The events are limited to the following parameters: microstructures in optical aurora and electron precipitation, irregularities in electron density, and small-scale electric fields in the lower ionosphere. It is shown that during disturbed conditions the auroral E region is affected by a superimposed structure and that a two stream plasma instability is one of the sources of irregularity. ESRO

N74-22988* Norwegian Defence Research Establishment, Kjeller.
RESONANCES OBSERVED ON MOTHER-DAUGHTER ROCKET FLIGHTS IN THE IONOSPHERE
K. Folkestad and J. Troeim *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 69-75 refs Sponsored in part by Norweg. Council for Ind. and Sci. Res. and NASA (For availability see N74-22980 14-13)

Resonance phenomena have been observed in swept frequency experiments carried out on two mother-daughter Nike-Tomahawk rocket flights at auroral latitudes. The experimental method is briefly described and characteristic samples of the results are presented. A possible interpretation of some main resonances is offered, involving cold plasma cone resonances. ESRO

N74-22989 Uppsala Ionospheric Observatory (Sweden).
SOUNDING ROCKET RESEARCH AT UPPSALA IONOSPHERIC OBSERVATORY: CURRENT ACTIVITIES AND SOME RECENT RESULTS
H. Derblom and B. Holback *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 77-81 refs (For availability see N74-22980 14-13)

Profiles of positive ion and electron densities, negative ion to electron ratio, electron loss rate and recombination coefficients are presented and discussed. ESRO

N74-22990 European Space Research Organization, Paris (France).

ESRO SATELLITE PROGRAMME RELATED TO SOUNDING ROCKET RESEARCH c30

G. P. Haskell *In its* European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 83-86 (For availability see N74-22980 14-13)

The scientific payload of the ESRO GEOS satellite is summarized together with the tentative payloads of the mother/daughter/heliocentric satellites which will make up a coordinated mission under the collective title International Magnetospheric Explorers (IME). ESRO

N74-22991 Centre d'Etude Spatiale des Rayonnements, Toulouse (France).

AURORAL AND SUBAURORAL RESEARCH BY BALLOON-BORNE AND GROUND-BASED MEASUREMENTS

J. P. Treilhou, A. Saint-Marc, G. Gasset, A. Boutonnet, I. A. Jouline (Izmiran, Inst., Moscow), and K. D. Kanonidi (Izmiran Inst., Moscow) *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 87-94 refs (For availability see N74-22980 14-13)
(Grants CNES-209-69; CNES-312-70)

Some results of X-ray precipitation, balloon-borne electric field and terrestrial magnetism measurements in auroral and sub-auroral zones are presented and discussed in the framework of their possible conjugate aspects. Author (ESRO)

N74-22992 Uppsala Ionospheric Observatory (Sweden).

EUROPEAN ACTIVITY IN CONNECTION WITH THE INTERNATIONAL MAGNETOSPHERIC STUDY (1976 - 1978)

W. Stoffregen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 103-108 (For availability see N74-22980 14-13)

As part of GEOS satellite mission plans extended ground base studies are required. Brief details are given of a committee set up to study this aspect and its task and the location of equipment in a ground station network is discussed. ESRO

N74-22993* University Coll., London (England). Mullard Space Science Lab.

COMPARISON OF PARTICLE RESULTS FROM A SOUNDING ROCKET AND A GEOSYNCHRONOUS SATELLITE

A. D. Johnstone *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 109-112 refs Sponsored in part by UK Sci. Res. Council (For availability see N74-22980 14-13)
(Contract NSR-02-001-025)

Auroral data from the ATS 5 geosynchronous satellite and an auroral rocket are compared with the purpose of illustrating some problems which will arise in comparison of data from the GEOS satellite and coordinated rocket experiments. It is recommended that all sky cameras be used in such studies and that since conjugacy between satellite and rocket cannot be guaranteed, the difference should be measured. ESRO

N74-22994* University Coll., London (England). Mullard Space Science Lab.

THE RESOLUTION OF TEMPORAL AND SPATIAL VARIATIONS IN AURORAL PARTICLE MEASUREMENTS FROM SOUNDING ROCKETS

A. D. Johnstone and T. N. Davis *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 113-118 refs Prepared jointly with Alaska Univ., Fairbanks (For availability see N74-22980 14-13)
(Contract NSR-02-001-025)

The problems involved in the resolution of the temporal/spatial ambiguity in sounding rocket observations are discussed with reference to an experiment involving a mother-daughter rocket combination, together with a flashing light beacon on the rocket and television cameras on the ground. The ambiguity was successfully removed, enabling a proper interpretation of the observations of precipitating low energy electrons to be made. Author (ESRO)

N74-22995 Norwegian Defence Research Establishment, Kjeller.

TEMPORAL AND SPATIAL VARIATIONS IN THE FLUX OF LOW-ENERGY AURORAL ELECTRONS

H. Moestue *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 119-122 refs (For availability see N74-22980 14-13)

Fluxes of low energy precipitated electrons have been measured on two mother-daughter sounding rockets during winter. Some examples of rapid time variations and sharp horizontal gradients in the practice fluxes are presented. Author (ESRO)

N74-22996 Kiruna Geophysical Observatory (Sweden).

ROCKET OBSERVATIONS OF ENERGY SPECTRA AND PITCH-ANGLE DISTRIBUTIONS OF AURORAL ELECTRONS

R. Lundin *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 123-132 refs Sponsored jointly by Swed. Nat. Sci. Res. Council and Swed. Board for Tech. Develop. (For availability see N74-22980 14-13)

Energy spectra and pitch angle distributions of auroral electrons in the energy range 2.5 - 12 keV observed on a sounding rocket flight are presented. Rapid variations in flux during the first part of the flight were followed by a period of fluxes below or close to the statistical level of detectability. During two periods of enhanced electron fluxes, so called inverted-V events were detected. Both events were associated with anisotropic pitch angle distributions peaked near 0 deg. However, isotropy over the upper hemisphere seemed to hold inside the regions of enhanced fluxes, while anisotropies peaked near 0 deg occurred in regions of strong flux intensity gradients. Author (ESRO)

N74-22997 Technische Hochschule, Graz (Austria). Dept. of Communications and Wave Propagation.

LOW-ENERGY PARTICLE MEASUREMENTS DURING A RELATIVISTIC-ELECTRON-PRECIPITATION EVENT

W. Riedler and M. Friedrich *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 133-140 refs Sponsored jointly by Austrian Council for Sci. Res. and Space Res. Inst. (For availability see N74-22980 14-13)

Results from a low energy particle experiment onboard a sounding rocket launched into a relativistic electron precipitation event are described. The count rates showed rapid variations on a short time scale whereas the average flux values were lelatively constant. No pronounced pitch angle dependence was observed. The proton fluxes were unexpetedly high, which may be due to the fact that the relativistic event was superimposed on a small, declining polar cap absorption event. Author (ESRO)

N74-22998 Oslo Univ. (Norway). Inst. of Cosmic Physics.

A ROCKET EXPERIMENT FOR STUDYING PROTON AURORAE

Karl Maseide and Finn Soeraas (Bergen Univ.) *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 141-156 refs Sponsored by Roy. Norweg. Council for Sci. and Ind. Res. (For availability see N74-22980 14-13)

The experiments and payloads of two Nike-Tomahawk rockets containing closely integrated instrumentation for making a comprehensive study of proton aurorae are described. The main intention was to relate the precipitating particle flux to the resulting light emissions and several ionospheric parameters. Some of the results are illustrated by comparing the directly observed vertical emission profile of H beta with the profile derived from particle measurements. The measurements, which are in good agreement, indicate that the density in the auroral region is half that given by the CIRA-1965 model atmosphere. Author (ESRO)

N74-22999 Liege Univ. (Belgium). Inst. d'Astrophysique.

PROGRESS OF THE PROBLEM OF AURORAL EMISSION NEAR 2150 A [DEVELOPMENTS DU PROBLEME DE L'EMISSION AURORALE AU VOISINAGE DE 2150 A]

R. Duysinx *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 157-160 refs In FRENCH (For availability see N74-22980 14-13)

Polar auroral spectra between 2000 and 3000 A were measured by two sounding rockets during October 1970. The data enabled the evolution of spectral emission as a function of altitude to be studied. Emphasis was placed on the study of the Vegard-Kaplan system, the oxygen line situated at 2972 A and the emission at 2150 A which was found to be unique in the spectral region covered. The results are discussed. ESRO

N74-23000 Liege Univ. (Belgium). Inst. d'Astrophysique.
COMPARATIVE AURORAL PHOTOMETRY BY MEANS OF POLYCHROMATORS ONBOARD SOUNDING ROCKETS [PHOTOMETRIE COMPARATIVE DES AURORES AU MOYEN DE POLYCHROMATEURS PLACES SUR FUSEES-SONDES]
M. Henrist *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 161-167 refs (For availability see N74-22980 14-13)

Two Centaure rockets were launched in 1971, each equipped with a 6-channel polychromator designed for studying emissions at wavelengths of 5577 A, 4861 A, 3914 A, 3160 A, 1450 A, and 1304 A. Good quality data were obtained and altitude profiles of the recorded emissions are presented and discussed. The advantages of the polychromator technique are discussed. Author (ESRO)

N74-23001 Norwegian Defence Research Establishment, Kjeller.
RECENT MEASUREMENTS OF D-REGION ION COMPOSITION
A. Johannessen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 169-174 refs Sponsored in part by Roy. Norweg. Council for Sci. and Ind. Res. (For availability see N74-22980 14-13)
(Contract WRK-222)

A rocket experiment was conducted in the high latitude summer mesosphere. The rocket payload was instrumented to study the ion composition near the cold summer mesopause and its relation to ambient temperature, ionization production, and ionization loss rate. The results showed that hydrated protons dominated the ion composition up to 84 km. Simultaneous measurements of electron density and ion pair production showed that the transition in ion composition was concurrent with a reduction in the effective recombination coefficient by about a factor of 10. Author (ESRO)

N74-23002 Danish Space Research Inst., Lyngby.
ON THE SPECTRUM OF AURORAL HISS IN THE IONOSPHERE
E. Ungstrup *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 175-180 refs (For availability see N74-22980 14-13)

New data on the spectrum of auroral hiss in the ionoshere obtained by four sounding rockets are presented. In all cases the spectrum of the auroral hiss falls off steeply above a characteristic frequency, which is of the order of the ion plasma frequency. The observed shape of the spectrum disagrees with predictions by the Cerenkov generation hypothesis, but suggests that the generation mechanism is electrostatic. A single coupling from electrostatic to electromagnetic waves is discussed and it is shown that both the intensity and spectrum of auroral hiss can be explained. Author (ESRO)

N74-23003 Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
THEORETICAL AND EXPERIMENTAL CONSIDERATIONS BEHIND BALLOON-BORNE ELECTRIC-FIELD EXPERIMENTS
R. Bostroem and U. Fahleson *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 181-190 refs (For availability see N74-22980 14-13)

The penetration of ionospheric electric fields to balloon altitudes, is reviewed. It is concluded that large scale components of the horizontal ionospheric fields can be measured at altitudes of 30-40 km. However, it is difficult to study ionospheric field variations at frequencies higher than about 0.1 Hz or to resolve spatial structures smaller than about 100 km. Technical problems associated and double probe measurements at the altitudes are discussed. The usefulness of the method is demonstrated by reviewing some results of previous measurements. Author (ESRO)

N74-23004 Radio and Space Research Station, Slough (England).
SOME REMAINING PROBLEMS IN THE FIELD OF HIGH-LATITUDE RESEARCH AND METHODS BY WHICH THEY MIGHT BE SOLVED
D. A. Bryant *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 191-199 refs (For availability see N74-22980 14-13)

Some of the remaining problems in high latitude research, particularly those connected with the precipitation of auroral particles, are discussed. Reference is first made to the general aims of high latitude research, and present knowledge of the magnetospheric processes that are involved in particle precipitation is then briefly reviewed. Particle measurements obtained using rockets flown at various phases of the auroral substorms are examined for the types of processes involved in particle acceleration and precipitation. Author (ESRO)

N74-23005 Norwegian Defence Research Establishment, Kjeller.
PROBLEMS RELATED TO THE OCCURRENCE OF FIELD-ALIGNED LOW-ENERGY ELECTRON FLUXES
B. N. Maehlum and H. Moestue *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 201-202 refs (For availability see N74-22980 14-13)

Problems concerning the softness of the energy spectrum adjacent to auroral arcs, the field alignment of low energy electron fluxes in the soft regions, the isotropic distribution of electron fluxes inside arcs, and the coincidence of border lines of arcs and regions of field aligned electrons are briefly discussed. ESRO

N74-23006 Max-Planck-Institut fuer Extraterrestrische Physik, Munich (West Germany).
GEOPHYSICAL SIGNIFICANCE OF SOUNDING-ROCKET FLIGHTS FROM ESRANGE OVER NORWAY INTO THE ARCTIC OCEAN
G. Haerendel *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 203-205 refs (For availability see N74-22980 14-13)

The coordination between the GEOS satellite mission and sounding rockets is briefly discussed, and emphasis is placed on the intersection of field lines with the position of GEOS. The suitability of Norwegian and Swedish launching sites is considered and it is concluded that during substorm periods, sounding rocket launchings would be best made from Sweden for coordinated measurements with GEOS. The problem of overflying Norwegian territory is raised. ESRO

N74-23007 Swedish Space Corp., Solna
ESRANGE c11
In ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 207-214 (For availability see N74-22980 14-13)

The technical facilities, launch capabilities, scientific conditions, instrumentation, scientific and ground support equipment at the ESRANGE sounding rocket range in northern Sweden are described. ESRO

N74-23008 Andoya Rocket Range, Andenes (Norway).
FACILITIES AT ANDOYA ROCKET RANGE c11
A. Gundersen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 215-221 (For availability see N74-22980 14-13)

The technical facilities, launch capabilities (including balloons), scientific conditions, ground support equipment, and future activities of the Andoya Rocket Range in northern Norway are described. ESRO

N74-23009 Danish Meteorological Inst., Copenhagen.
SOENDRE STROEMFJORD ROCKET RANGE, GREENLAND c11
T. Stockflet Joergensen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 223-226 (For availability see N74-22980 14-13)

The range facilities, launch restrictions, and meteorological conditions of the sounding rocket range in Greenland are described. ESRO

N74-23010 Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).

A NEW HIGH-ALTITUDE ROCKET SYSTEM c31

J. Simon and W. T. Fisher (Bristol Aerojet Ltd.) *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 227-234 refs (For availability see N74-22980 14-13)

The payload, system, propulsion, roll-jaw resonance and cost effectiveness of a new two-stage, solid propellant sounding rocket are described and discussed. The performance of the vehicle which is still under development, is described against the background of other rocket performances. ESRO

N74-23011 British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronic and Space Systems Group.

SKYLARK 12, A HIGH-ALTITUDE SOUNDING ROCKET FOR 44 cm-DIAMETER PAYLOADS OF UP TO 200 kg MASS c31

D. J. Brown and J. W. Furst *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 235-243 refs (For availability see N74-22980 14-13)

The three-stage Skylark 12 rocket vehicle, which is capable of reaching 850 km with a payload mass of 150 kg, is described. Performance evaluations of the various stages and the vehicle itself are presented and the design features of each stage are discussed. Launch facilities and impact dispersion are also briefly considered. ESRO

N74-23012 Bristol Aerospace, Ltd., Winnipeg (Manitoba).

BLACK BRANT VEHICLES AND SYSTEMS c31

W. J. Thiessen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 245-250 (For availability see N74-22980 14-13)

The Black Brant sounding rocket family is discussed with emphasis on performance characteristics. Three systems recently developed for use on Black Brant vehicles are then described. These are: The vertical hinge clamshell assembly for the experimental aperture, the ogive recovery system assembly, and the payload inverter system to protect against impact damage. ESRO

N74-23013 Space Vector Corp., Northridge, Calif.

THE USE OF APPROXIMATE ANALYSES TO DETERMINE THE PERFORMANCE, AUTHORITY, AND IMPULSE OF SOUNDING-ROCKET BOOST-CONTROL-SYSTEMS c31

C. P. Hoult *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 251-260 refs (For availability see N74-22980 14-13)

The analytical are tools/developed which apply to inertially referenced guidance systems operating during the early boost trajectory of sounding rockets. The operating concepts of wind weighting, zero lift trajectory during control, fail safe design, and the location of the control system are discussed. It is shown that a fail safe system will have the least reduction in apogee altitude when compared with the unguided version of the same rocket. Simple, perfect autopilot analytical models for dispersion, authority and impulse are developed. Separate dynamical models are used for the unguided and guided phases of the trajectory. Author (ESRO)

N74-23014 Norwegian Defence Research Establishment, Kjeller.

TYRO: A GYRO REFERENCE PLATFORM FOR SOUNDING ROCKETS c14

T. Gerhardsen and H. K. Johansen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 269-273 (For availability see N74-22980 14-13)

An attitude reference platform for sounding rockets is reported which measures pitch, jaw and roll angles of the rocket relative to a chosen reference coordinate frame. The platform contains a timing and test unit as well as a power supply. Mechanical design and system accuracy are discussed and platform parameters and operation noted. ESRO

N74-23015 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).

DFVLR MOBILE RAKETENBASIS SOFTWARE CAPABILITY FOR SOUNDING ROCKETS c08

H. Bader *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 277-290 refs (For availability see N74-22980 14-13)

The software capability of the DFVLR Mobile Raketenbasis is described pointing out in which fields digital computer programs and related documentation are available. The working of one of the aeroelastic analysis programs is briefly explained as an example. A complete list of computer programs available together with a brief description of each is given. Author (ESRO)

N74-23016 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).

SPECIAL TEST AND HARDWARE EQUIPMENT AT THE DFVLR MOBILE RAKETENBASIS c31

D. Joneleit *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 291-293 (For availability see N74-22980 14-13)

The attitude control systems test laboratory is described. Emphasis is placed on the mobility of equipment needed to check out and test such systems. Current activities in recovery systems and engineering of special payload subsystems are also briefly discussed. ESRO

N74-23017 European Space Technology Center, Noordwijk (Netherlands). Space Science Dept.

EXPERIENCE OF CO-OPERATION IN THE ESRO SOUNDING-ROCKET PROGRAMME c34

A. Pedersen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 295-299 (For availability see N74-22980 14-13)

The role of ESRO's sounding rocket program in the development of space research in Europe is summarized and the present situation is analyzed. The working methods used in the selection and development of payloads are briefly described and the experience gained is looked at in light of future activities. ESRO

N74-23018# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

AN INTEGRATED MODEL OF STORM-GENERATED WAVES

Donald T. Resio and Bruce P. Hayden Dec. 1973 275 p refs
(Contract N00014-69-A-0060-0006; NR Proj. 389-158)
(AD-774915; TR-8) Avail: NTIS CSCL 08/3

A model which synthesizes large-, synoptic- and small-scale atmospheric motions is developed to investigate several attributes of coastal wave climates. A statistical treatment of storm frequencies over a set of tracks is combined with theoretical models for wave and surf generation. Results indicate highly significant secular and seasonal variations in large-scale circulation patterns. Associated with the large-scale changes are changes in storm frequency of 20% or more along some tracks. For three test sites along the east coast, such variations in storm activity are found to produce marked seasonal and secular changes in the wave-surge climate, primarily in extreme conditions. Author (GRA)

N74-23019# Florida State Univ., Tallahassee. Mesoscale Air-Sea Interaction Group.

THE INFLUENCE OF COASTLINE GEOMETRY AND BOTTOM TOPOGRAPHY ON THE EASTERN OCEAN CIRCULATION

Harley E. Hurlburt Jan. 1974 115 p refs
(Contract N00014-67-A-0235-0002; Grant NSF GA-29734; NR Proj. 083-231)
(AD-775254; Rept-117) Avail: NTIS CSCL 08/3

An important feature of the eastern ocean circulation is coastal upwelling. Associated with the upwelling is an equatorward surface jet and a poleward undercurrent. The present investigation focuses attention on the effects longshore variations in bottom topography and coastline geometry have on these phenomena. GRA

N74-23020# Army Cold Regions Research and Engineering Lab., Hanover, N.H.

INVESTIGATIONS PERFORMED ON THE ARCTIC ICE DYNAMICS JOINT EXPERIMENT, MARCH 1971

S. F. Ackley, W. D. Hibler, III, A. Kovacs, W. F. Weeks, and A. Hartwell Dec. 1973 68 p refs

(ARPA Order 1615)
(AD-775381; CRREL-RR-315) Avail: NTIS CSCL 08/12

Contents: Mesoscale strain measurements on the Beaufort Sea pack ice; Structure of a multiyear pressure ridge; Top and bottom roughness of a multiyear ice floe; Airphoto analysis of ice deformation in the Beaufort Sea; Data on morphological and physical characteristics of sea ice in the Beaufort Sea. GRA

N74-23021# Naval Postgraduate School, Monterey, Calif.
CORRECTIONS FOR UNDERWATER GRAVIMETRY Interim Report
Robert S. Andrews Jan. 1974 16 p refs
(AD-774867; NPS-58AD74011A) Avail: NTIS CSCL 08/5

Because underwater gravity surveys are usually conducted in coastal waters, several unique corrections are required to reduce the observed data for calculation of free-air and Bouguer anomalies. The most logical sequence for the application of corrections would be: terrain correction (if necessary) to reduce bathymetric irregularities to a flat, horizontal bottom; removal of the upward attraction of the water above the meter; free-air correction to bring the meter measurement to the surface of the reference spheroid; filling in the ocean below the spheroid with rock for a Bouguer anomaly calculation or with water for a free-air anomaly calculation. The terrain correction must be handled carefully as the bathymetric irregularities are immersed in water of finite density and, due to the close proximity of land, topographic irregularities immersed in air may be within the range of the correction graticule grid. (Modified author abstract) GRA

N74-23022# Physical Dynamics, Inc., Berkeley, Calif.
A SPECTRAL TRANSFER MODEL OF OCEAN WAVE SPECTRA. 1: FORMULATION
J. Alex Thomson and Bruce J. West May 1973 104 p refs
(Contract F30602-72-C-0494; ARPA Order 1649)
(AD-774766; PD-72-029; RADC-TR-73-192) Avail: NTIS CSCL 08/3

A one-dimensional spectral transfer equation is developed for ocean surface waves in the presence of non-uniform surface currents. The formalism is phenomenological and includes several parameters which are determined by comparison with data. The model contains phenomenological descriptions of wave breaking, wind generation and amplification, radiation stress, viscous damping, capillary effects, wave-wave interaction, non-linear wave group velocities and convective and refraction terms. The free parameters are determined by fitting the model to the Pierson-Stacy representation of a fully developed sea. Numerical calculations are carried out following wave packets along trajectories in k,x space. The effects of wave reflections and trappings by moving current patterns are included. Author (GRA)

N74-23023# Naval Research Lab., Washington, D.C.
REFLECTION OF INTERNAL GRAVITY WAVES BY A LAYERED DENSITY ANOMALY Final Report
Richard P. Mied and John P. Dugan 21 Dec. 1973 33 p refs
(WF1125703)
(AD-775298; NRL-7649) Avail: NTIS CSCL 08/3

The characteristics of the propagation of internal gravity waves in the ocean, either upward from the bottom or downward from the region of the surface, is of interest to oceanographers because of the implications to the total energy budget of the internal wave field. This report considers the interaction of a plane internal wave train with a diffuse layer embedded in a density profile possessing an otherwise exponential dependence of height. GRA

N74-23024# Woods Hole Oceanographic Institution, Mass.
CRUISE REPORT: CHAIN 112, LEG 6, 24 JUNE - 9 JULY 1973
Robert H. Heinmiller Aug. 1973 50 p
(Contract N00014-66-C-0241; NR Proj. 083-004)
(AD-774098; WHOI-73-50) Avail: NTIS CSCL 08/3

CHAIN 112, Leg VI carried out mooring work from 24 June to 9 July, 1973. A total of two moorings was set and 19 recovered. All work was done near the 70th meridian at the MODE Site (vicinity of 28 degrees N., 69 deg 40 min W.) and Site D (vicinity of 39 deg 10 min N., 70 deg 00 min W.). Author (GRA)

N74-23025# Woods Hole Oceanographic Institution, Mass.
CRUISE REPORT: CHAIN 112, LEGS 1 AND 2, 6 MARCH - 5 APRIL 1973
Robert H. Heinmiller Aug. 1973 58 p
(Contract N00014-66-C-0241; NR Proj. 083-004)
(AD-774099; WHOI-73-51) Avail: NTIS CSCL 08/3

CHAIN 112, Legs I and II carried out mooring work from 6 March to 5 April, 1973. A total of 20 moorings was set and five recorded. All work was done near the 70th meridian at Site D (vicinity of 39 deg 10 min N., 70 deg 00 min W.) and the MODE Site (vicinity of 28 degrees N, 69 deg 40 min W.). Author (GRA)

N74-23026# Washington Univ., Seattle. Dept. of Oceanography.
SOME CHEMICAL AND PHYSICAL PROPERTIES OF THE EASTERN TROPICAL NORTH PACIFIC WITH EMPHASIS ON THE OXYGEN MINIMUM LAYER
Louis A. Codispoti Oct. 1973 49 p refs
(Contracts N00014-67-A-0103-0014; Nonr-477(37); Grants NSF GA-10084; NSF GA-24875; NR Proj. 083-012)
(AD-774117; REF-M73-64; TR-289) Avail: NTIS CSCL 08/10

The report is basically an atlas presenting diagrams and charts of temperature, salinity, oxygen, nutrient, and relative baroclinic current data for the eastern tropical North Pacific. Special emphasis is on the oxygen deficient layer in this region and a number of the charts constitute an isentropic study of this layer. Two of the included properties, nitrate deficits and equivalent nitrate, are particularly appropriate for investigations dealing with denitrification in these waters, and the methods for calculating them are described. Author (GRA)

N74-23027# Wisconsin Univ., Madison. Dept. of Geography.
THE ACCURACY OF ISOMETRIC MAPS Final Report, 1 Jan. 1971 - 31 Aug. 1973
Joel L. Morrison Feb. 1974 30 p refs
(Grant DA-ARO(D)-31-124-71-G45)
(AD-775544; AROD-9450-3-GS) Avail: NTIS CSCL 08/2

The problem investigated by this research was: For a fixed number and scatter of known data points from a geographical distribution with unknown spatial variation, what automated first-stage interpolation algorithm should a cartographer use to most faithfully map the distribution isarithmically? The conclusions, based on an empirical study, state the most effective first-stage algorithm to use with different levels of numbers of known data points and scatters of known data points. GRA

N74-23028# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
ANALYSIS OF LASER DATA FOR GEODETIC PURPOSES Final Report, 2 Apr. - 30 Sep. 1973
Irwin I. Shapiro and Robert W. King 25 Oct. 1973 7 p refs
(Contract F19628-73-C-0248; AF Proj. 7600)
(AD-775393; AFCRL-TR-73-0689) Avail: NTIS CSCL 08/5

MIT's Planetary Ephemeris Program has been modified to permit a weighted least squares estimate for variations in the earth's rotation and polar motion using earth satellite and lunar laser ranging data. A test solution was performed with data obtained during the first two years of the lunar laser ranging experiment. Author (GRA)

N74-23029# Hydrologic Engineering Center, Davis, Calif.
HYDROLOGIC ENGINEERING METHODS FOR WATER RESOURCES DEVELOPMENT. VOLUME 4: HYDROGRAPHY ANALYSIS Final Report
Edward F. Hawkins, Warren Sharp, Dale Burnett, and Ken Brooks Oct. 1973 125 p refs
(AD-774261; HEC-IHD-400) Avail: NTIS CSCL 08/8

This is Volume 4 of the 12 Volume report prepared by The Hydrologic Engineering Center of the U.S. Army Corps of Engineers as a contribution to the International Hydrological Decade. This volume describes practical techniques for analyzing precipitation, snowmelt, infiltration, and runoff processes as they relate to the computation of flood hydrographs. Topics discussed include:

Estimation of the areal depth and distribution of precipitation; Calculation of runoff from snowmelt; Determination of loss rates by linear and nonlinear functions; unit hydrograph theory and derivation; hydrograph reconstitution; and the Estimation of unit hydrograph and loss rate coefficients for ungaged areas. Descriptions of generalized computer programs for Basin Rainfall and Snowmelt Computations and Unit Hydrograph and Loss Rate Optimatization are included as appendices. Author (GRA)

N74-23030# Montana State Univ., Bozeman. Water Resources Research Center.
FLOODPLAIN MAPPING AND PLANNING FOR THE 50 AND 100 YEAR INTERVAL FLOOD ZONES OF THE BITTERROOT VALLEY, MONTANA
K. Michael Nolan Oct. 1973 103 p refs
(PB-226082/6; OWRR-A-064-MONT(1)) Avail: NTIS HC $4.25 CSCL 13B

Flood hazard maps, delineating 50-year and 100-year flood plain areas, were prepared for an 80-mile reach of the Bitterroot River in Western Montana. Discharge rates corresponding to 50-year and 100-year recurrence frequency were obtained for six stations on the river using graphical methods suggested by the U.S. Geological Survey. River stage was monitored at 15 locations in the reach for a 14-day period during the June 1972 snowmelt runoff season to develop simulated rating curves. Aerial photographs of the reach were taken on June 1, 1972 when the river was in flood stage but before the snowmelt peak had occurred. The photographs were used in conjunction with the ground control sites to establish flood boundaries corresponding to 50 and 100-year floods. GRA

N74-23031# Utah State Univ., Logan. Utah Water Research Lab.
INTEGRATED MEASUREMENT OF SOIL MOISTURE BY USE OF RADIO WAVES
Duane G. Chadwick Nov. 1973 98 p refs
(Contract DI-14-31-0001-3657)
(PB-227242/5; PRWG103-1; OWRR-B-062-UTAH(2); W74-03772) Avail: NTIS HC $4.00 CSCL 08M

An integrated value of soil moisture can be determined by measuring the attenuation of vertically-poloraized surface radio waves that are propagated over the ground between a transmitting and receiving antenna. Soil moisture values in the root-zone region were measured over longitudinal distances typically ranging from 50 feet to 600 feet with good results. Integrated soil moisture measurements over greater distances are also possible. The received field strength of propagated radio surface waves closely matches theoretical calculations. Author (GRA)

N74-23032# Federal Highway Administration, Arlington, Va. Research and Development Demonstration Projects Div.
AERIAL ANALYTICAL TRIANGULATION Final Report
David Wolf Dec. 1973 36 p refs
(PB-227276/3; FHWA-RDDP-1-1) Avail: NTIS HC $3.25 CSCL 08B

This project, as part of the FHWA Demonstration Projects Program, was intended to demonstrate to the Arkansas Highway Department the cost savings that accrue when aerial analytical triangulation is used, rather than ground surveys alone, to develop mapping control for an actual Arkansas project. Aerial analytical trangulation is a technique for minimizing the requirement for costly ground surveys associated with the compilation of topographic maps using aerial photography. Aerial analytical triangulation utilizes a complex mathematical analysis of precise x-y coordinate measurements of artificial images, marked in the triple overlap area of a series of three, adjacent, overlapping aerial photographs, combined with a limited network of ground survey data to develop a complete network of control points for use in stereoscopic mapping. (Modified author abstract) GRA

N74-23033# Naval Research Lab., Washington, D.C.
AURORAL EMISSION AND INELASTIC ELECTRON COLLISION PROCESSES IN AIR
A. W. Ali Nov. 1973 25 p refs
(NRL Proj. H02-35)
(AD-776211; NRL-MR-2742) Avail: NTIS CSCL 04/1

A survey of the auroral emissions and all inelastic electron collision processes in N_2, O_2, O and NO is made. It is intended to show the available experimental and theoretical data on the relevant cross sections and point out the need for data where none exists. Author (GRA)

N74-23034# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
MILLSTONE HILL INCOHERENT SCATTER OBSERVATIONS OF THE IONOSPHERIC RESPONSE TO THE SOLAR FLARE OF 7 AUGUST 1972 Environmental Research Papers
Michael Mendillo and John V. Evans 6 Nov. 1973 28 p refs
Prepared in cooperation with Mass. Inst. of Tech., Lincoln Lab., Lexington
(AF Proj. 4643)
(AD-775743; AFCRL-ERP-458; AFCRL-TR-73-0686) Avail: NTIS CSCL 04/1

The Millstone Hill incoherent scatter radar was in operation during the important 3B solar flare which occurred at 15:00 UT on 7 August 1972. Measurements of the electron density profile were made over the height range of 125 to 1200 km, together with observations of the electron temperature, ion temperature, and vertical drift velocity above 225 km. The ionospheric NeH profiles obtained span the largest height range ever studied during flares, while the temperature and drift data represent the first measurements of these parameters ever made under flare conditions. In discussing the overall results obtained during this event, estimates are made of the flare-induced electrodynamic and thermal processes which contribute to the observed effects. (Modified author abstract) GRA

N74-23035# Dartmouth Coll., Hanover, N.H. Radiophysics Lab.
INVESTIGATION OF IONOSPHERIC CHANGES Final Report, 1 Oct. 1971 - 30 Sep. 1972
Millett G. Morgan 14 Dec. 1973 24 p
(Contract F19628-72-C-0051; AF Proj. 5631)
(AD-776024; AFCRL-TR-73-0764) Avail: NTIS CSCL 04/1

A three-station ionosonde network in northern New Hampshire and Vermont was operated continuously, obtaining records every two minutes. The stations are mutually about 100 miles apart. Programs were written and brought to an operational state for reducing the film records of the ionograms by means of a Spiras-65 computer and Graphacon digitizing tablet. The system is now ready for the production of iso-height contours of the true height of ionization and their intercomparison among the three stations, to develop a body of statistics on travelling ionospheric disturbances. (Modified author abstract) GRA

N74-23036# Weston Observatory, Mass.
INVESTIGATION OF THE NATURE OF MAGNETIC FIELD PHENOMENA IN THE IONOSPHERE Final Report, 1 Nov. 1970 - 31 Jul. 1973
Robert A. Somers 31 Aug. 1973 21 p
(Contract F19628-71-C-0083; AF Proj. 7601)
(AD-775985; AFCRL-TR-73-0596) Avail: NTIS CSCL 04/1

The construction and testing of portions of sounding rocket payloads and the engineering services furnished for auroral zone magnetic field measurements are summarized. Operation and calibration of the component magnetic observatory and the low field coil facility required for payload design and check out are discussed. Plans for future operations and a statement of contract value are presented. Author (GRA)

N74-23037# Geological Survey, Boulder, Colo.
TESTS OF NEW STYLE MAGNETOMETERS FOR DETECTION OF GEOMAGNETIC VARIATIONS Final Report
W. H. Campbell 22 Feb. 1974 26 p refs
(Contract NAonr-21-72)
(AD-775890) Avail: NTIS CSCL 08/14

A cryogenic SQUID magnetometer and narrow-line rubidium magnetometer were tested against more conventional systems to determine their ability to detect natural field fluctuations. The cryogenic system was shown to be extremely sensitive and suitable for short-term detection of geomagnetic pulsations. Author (GRA)

N74-23038# General Electric Co., Santa Barbara, Calif. DNA Information and Analysis Center.
REACTION RATE DATA NUMBER 43

Oct. 1973 35 p refs
(Contract DNA001-73-C-0019)
(AD-775842) Avail: NTIS CSCL 07/4

The report contains abstracts of research in aeronomy and upper atmospheric chemical processes and reaction kinetics. Nuclear fireballs, gas ionization, plasmas, and spectra of atmospheric species are other topics covered. GRA

N74-23165 Joint Publications Research Service, Arlington, Va.
BASIC AND CONJUGATE EQUATIONS OF ATMOSPHERIC AND OCEANIC DYNAMICS
G. I. Marchuk *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 9-39 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 9-37 (For availability see N74-23163 14-20)

N74-23169 Joint Publications Research Service, Arlington, Va.
FREEZING OF RIVERS AND TYPES OF ICE JAMS
R. A. Nezhikhovskiy *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 77-85 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 68-74 (For availability see N74-23163 14-20)

N74-23171 Joint Publications Research Service, Arlington, Va.
SPECIAL POSTCARDS FOR GATHERING INFORMATION ABOUT SURFACE CURRENTS IN WATER BODIES
V. M. Bukin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 94-98 ref Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 82-85 (For availability see N74-23163 14-20)

N74-23172 Joint Publications Research Service, Arlington, Va.
ON THE TURBULENT STRUCTURE OF BOTTOM DENSITY CURRENTS
V. N. Anuchin, A. M. Gusev, and Yu. G. Pyrkin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 99-104 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 85-88 (For availability see N74-23163 14-20)

N74-23173 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF VARIOUS SPRING FERTILIZATION TIMES ON GROWTH AND DEVELOPMENT OF WINTER WHEAT WITH CONSIDERATION OF SOIL WATER RUNOFF
L. K. Konstantinov and V. S. Shkreba *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 105-109 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 88-90 (For availability see N74-23163 14-20)

N74-23177 Joint Publications Research Service, Arlington, Va.
EXPERIENCE OF THE MURMANSK UGMS IN SERVICING THE MERCHANT MARINES AND FISHING FLEET IN THE NORTH SEAS AND NORTH ATLANTIC
F. S. Terziyev *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 139-148 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 108-113 (For availability see N74-23163 14-20)

N74-23178 Joint Publications Research Service, Arlington, Va.
OCEANOLOGY, TERMS AND DEFINITIONS (GOST 18451-73, GOST 18458-73)
G. S. Ivanov *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 149-151 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 114-115 (For availability see N74-23163 14-20)

N74-23179 Joint Publications Research Service, Arlington, Va.
SOIL MOISTURE
M. A. Kozin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 152-157 Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 115-116 (For availability see N74-23163 14-20)

N74-23181 Joint Publications Research Service, Arlington, Va.
SYMPOSIUM ON DIFFERENCE AND SPECTRAL METHODS OF SOLVING ATMOSPHERIC AND OCEANIC DYNAMICS PROBLEMS
S. A. Mashkovich *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 160-165 Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 118-121 (For availability see N74-23163 14-20)

N74-23182 Joint Publications Research Service, Arlington, Va.
GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP)
L. S. Gandin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 166-171 Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 121-124 (For availability see N74-23163 14-20)

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-23039* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPARATUS FOR CONTROLLING THE TEMPERATURE OF BALLOON-BORNE EQUIPMENT Patent
Milton Schach and Jack J. Triolo, inventors (to NASA) Issued 30 Apr. 1974 5 p Filed 14 Aug. 1972 Supersedes N72-33379 (10 - 24, p 3214)
(NASA-Case-GSC-11620-1; US-Patent-3,807,384; US-Patent-Appl-SN-280305; US-Patent-Class-126-270; US-Patent-Class-244-31; US-Patent-Class-244-127) Avail: US Patent Office CSCL 14B

A novel apparatus for controlling the temperature of balloon-borne equipment is disclosed, the apparatus serving to utilize the radiant energy emitted by the earth and its atmosphere so as to control the temperature of equipment. The apparatus comprises a housing to be carried aloft by a balloon and defining an enclosure for an instrumentation package. The enclosure includes an upper shield portion as well as a bottom window portion at the base, the bottom window facing the earth below during flight. The upper shield portion is constructed of a material such as aluminized Mylar, which serves to reflect direct sunlight. Official Gazette of the U.S. Patent Office

N74-23040* National Aeronautics and Space Administration. Pasadena Office, Calif.
SINGLE REFLECTOR INTERFERENCE SPECTROMETER AND DRIVE SYSTEM THEREFOR Patent
Rudolf A. Schindler, inventor (to NASA) (JPL) Issued 7 May 1974 10 p Filed 1 Dec. 1972 Supersedes N73-29438 (11 - 20, p 29438) Avail: US Patent Office
(NASA-Case-NPO-11932-1; NASA-Case-NPO-13127-1; US-Patent-3,809,481; US-Patent-Appl-SN-311234; US-Patent-Class-356-1065; US-Patent-Class-356-113)
Sponsored by NASA CSCL 20F

In a Fourier interference spectrometer of the doublepass retroreflector type, a single mirror is employed in the path of both split beams of an incoming ray to cause them to double back through separate retroreflectors. Changes in optical path length are achieved by linear displacement of both retroreflectors using a motor driven lead screw on one for large, low frequency changes, a moving-coil actuator on the other for smaller, mid-frequency changes and a piezoelectric actuator on one of these two for small, high frequency changes.
Official Gazette of the U.S. Patent Office

N74-23041 Ernst-Mach-Inst., Freiburg (West Germany).
HOLOGRAPHIC REAL TIME INTERFEROMETRY IN GAS DYNAMICS AND PLASMA PHYSICS [HOLOGRAPHISCHE ECHTZEIT-INTERFEROMETRIE IN GASDYNAMIK UND PLASMAPHYSIK]
Gerd Wortberg Oct. 1973 51 p refs In GERMAN; ENGLISH summary
(Rept-6/73) Avail: Issuing Activity

Holographic interferometry offers a unique advantage over classical interferometry in gas dynamic research because density measurements are not affected by small imperfections of the optical components. It was demonstrated that an inexpensive interferometer may be set up which offers all the advantages of the well known Mach-Zehnder-interferometer. Making use of the concept of homologous rays, it can be shown that when taking Fourier transform holograms the spacing, direction, and location of the interference fringes may be changed independently by small movements of the hologram in appropriate directions after development. Author (ESRO)

N74-23042*# TRW Systems Group, Redondo Beach, Calif.
AUGMENTED RIGS Phase 2 Report, 15 Jul. 1973 - 15 Jan. 1974
R. A. Kaminskas and D. McGuire 15 Jan. 1974 32 p
(Contract NAS8-28574)
(NASA-CR-120212) Avail: NTIS HC $4.75 CSCL 14B

The results of the Phase 2 Resonant Infrasonic Gauging System (RIGS) development program are presented. The program consisted of design, fabrication, and testing of an 'augmented' RIGS concept. The RIGS is a gauging system capable of measuring propellant quantities in zero-g as well as under accelerated conditions. Except for hydrogen, it can be used to gauge virtually any propellant in liquid form, including cryogenics. The gage consists of a sensor unit which is attached to the propellant tank and an electronic control unit which may be positioned separately from the sensor. The control unit receives signals from the sensor as well as the propellant temperature measurement and the ullage gas pressure, and computes the propellant quantity in the tank. Author

N74-23043*# Carnegie Institution of Washington, Stanford, Calif.
MODERNIZATION OF THE 60-INCH TELESCOPE AT THE MOUNT WILSON OBSERVATORY Final Report
Dec. 1973 8 p
(Grant NSR-09-140-001)
(NASA-CR-138242) Avail: NTIS HC $4.00 CSCL 14B

A contract for modernization of the Mount Wilson 60-inch telescope was awarded. Under this contract, the original hour angle and declination drives were replaced, digital coordinate readouts were added, a Cassegrain/ coude flip cage was built and installed, the telescope was completely rewired, a new control console was installed, and a coude spectrograph was completed. Extensive building modifications also were made to provide a working floor at mezzanine level for a computer and a coude observing room. These modifications and additions were completed by February 1970, and the telescope returned to regular and continuous use for stellar and planetary astronomy. Author

N74-23044# Joint Publications Research Service, Arlington, Va.
OPTICAL AND PHOTOELECTRIC DEVICES
9 May 1974 15 p refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 9, 1973 p 98-106
(JPRS-61944) Avail: NTIS HC $4.00

A method for increasing the focusing accuracy of visual and photoelectric systems is described along with the design of a four-mirror, long-focus, large aperture objective system. For individual titles, see N74-23045 through N74-23046.

N74-23045 Joint Publications Research Service, Arlington, Va.
INCREASING THE FOCUSING ACCURACY OF VISUAL AND PHOTOELECTRIC SYSTEMS
M. I. Kalinin *In its* Opt. and Photoelec. Devices (JPRS-61944) 9 May 1974 p 1-6 refs Transl. into English from Priborostroyeniye (Leningrad), no. 9, 1973 p 102-106 (For availability see N74-23044 14-14)

A method for increasing the focusing accuracy is considered which uses mirror reflection from the surface of an installed marker. The process of installing a sighting grid, an analyzing raster, and a light-sensitive layer or other marker in the focal plane of the image is commonly used in assembling various optical devices. The majority of markers are a flat glass surface with a picture applied by photocopying with subsequent etching. It is well known that when light energy falls on the boundary between the air and glass, part of it is always reflected. This circumstance is the basis for the proposed focusing method. The accuracy of the method does not depend on the structure and contrast of the picture of the marker being set because the determination of the plane of the setting is made by the sharp image of the collimation grid, the structure and contrast of which may be selected to be optimal. Author

N74-23046 Joint Publications Research Service, Arlington, Va.
A FOUR-MIRROR LONG-FOCUS LARGE APERTURE OBJECTIVE
N. N. Tulyeva *In its* Opt. and Photoelec. Devices (JPRS-61944) 9 May 1974 p 7-12 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 9, 1973 p 98-102 (For availability see N74-23044 14-14)

The article considers a new type of astronomical objective mirror based on the Mersenne system. Design data and aberration curves for the system are given. The proposed objective has no spherical aberration, clots, or astigmatism because its components (Mersenne's system and the concentric two-mirror objective)are free from these aberrations. Author

N74-23047*# Colorado School of Mines, Golden. Dept. of Geology.
EVALUATION OF MULTIBAND PHOTOGRAPHY FOR ROCK DISCRIMINATION
Gary L. Raines May 1974 119 p refs
(Grants NGL-06-001-015; DA-ARO(D)-31-124-71-G101; DA-ARO(D)-31-124-73-G88)
(NASA-CR-138226; Rept-74-2) Avail: NTIS HC $8.75 CSCL 14E

An evaluation is presented of the multiband photography concept that tonal differences between rock formations on aerial photography can be improved through the selection of the appropriate bands. The concept involves: (1) acquiring band reference data for the rocks being considered; (2) selecting the best combination of bands to discriminate the rocks using these reference data; (3) acquiring aerial photography using these selected bands; and (4) extracting the desired geologic information in an optimum manner. The test site geology and rock reflectance are discussed in detail. The evaluation found that the differences in contrast ratios are not statistically significant, and the spectral information in different bands is not advantageous. K.M.M.

N74-23048*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIOMETRY OF WATER TURBIDITY MEASUREMENTS
W. R. McCluney Apr. 1974 26 p refs
(NASA-TM-X-70641; X-913-74-109) Avail: NTIS HC $4.50 CSCL 14B

An examination of a number of measurements of turbidity reported in the literature reveals considerable variability in the definitions, units, and measurement techniques used. Many of these measurements differ radically in the optical quantity measured. The radiometric basis of each of the most common definitions of turbidity is examined. Several commercially available turbidimeters are described and their principles of operation are evaluated radiometrically. It is recommended that the term turbidity be restricted to measurements based upon the light scattered by the sample with that scattered by standard suspensions of known turbidity. It is also recommended that the measurement procedure be standardized by requiring the use of Formazin as the turbidity standardizing material and that the Formazin Turbidity Unit (FTU) be adopted as the standard unit of turbidity. Author

N74-23049# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
AN APPARATUS FOR MEASUREMENT OF THE FLASH DEGRADATION OF POLYMERS
Hirotaro Kambe, Hiroaki Watanabe, Shigeru Nagatomo, and Yutaka Itoh Mar. 1974 10 p refs
(ISAS-506-Vol-39-No-3) Avail: NTIS HC $4.00

An apparatus for measuring degradation reactions of polymer samples by flash irradiation was constructed for the investigation of fast degradation mechanisms of polymers in vacuum or in various atmospheres. The essential part of the apparatus is a sample tube surrounded by a helical xenon flash lamp stored in a cylindrical mirror, with an optical filter system, if necessary. A high-voltage capacitor bank charges the flash lamp, which is discharged in turn at triggering by high frequency current. Polymer sample films were degraded by a number of flash irradiations repeated in sequence, in vacuum or in an inert gas. Degradation products were analyzed by a highly sensitive gas chromatograph with a hydrogen flame ionization director. Typical results on flash degradation of polymethyl methacrylate in vacuum and in nitrogen are shown. Author

N74-23050*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MINIATURE SHEATHED THERMOCOUPLES FOR TURBINE BLADE TEMPERATURE MEASUREMENT

Raymond Holanda, George E. Glawe, and Lloyd N. Krause Washington May 1974 24 p refs
(NASA-TN-D-7671; E-7838) Avail: NTIS HC $3.00 CSCL 14B

An investigation was made of sheathed thermocouples for turbine blade temperature measurements. Tests were performed on the Chromel-Alumel sheathed thermocouples with both two-wire and single-wire configurations. Sheath diameters ranged from 0.25 to 0.76 mm, and temperatures ranged from 1080 to 1250 K. Both steady-state and thermal cycling tests were performed for times up to 450 hr. Special-order and commercial-grade thermocouples were tested. The tests showed that special-order single-wire sheathed thermocouples can be obtained that are reliable and accurate with diameters as small as 0.25 mm. However, all samples of 0.25-mm-diameter sheathed commercial-grade two-wire and single-wire thermocouples that were tested showed unacceptable drift rates for long-duration engine testing programs. The drift rates were about 1 percent in 10 hr. A thermocouple drift test is recommended in addition to the normal acceptance tests in order to select reliable miniature sheathed thermocouples for turbine blade applications. Author

N74-23051*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A SYSTEMATIC STUDY OF FOCAL RATIO AND EFFECTS OF OPTICAL MISALIGNMENT FOR LST

Charles L. Wyman May 1974 16 p refs
(NASA-TN-D-7627; M-222) Avail: NTIS HC $3.00 CSCL 14B

Possible large space telescope geometries are studied to determine performance and the effects of misalignments. The results are displayed parametrically as a function of relative back focal distance (RBFD). As RBFD increases, a larger high resolution field is obtained, and misalignment effects become less severe. Author

N74-23052# National Environmental Research Center, Research Triangle Park, N.C. Office of Research and Development.

PROGRESS IN INSTRUMENTATION AND TECHNIQUES FOR MEASUREMENT OF AIR POLLUTION

A. H. Ellison Jan. 1974 26 p refs
(EPA-650/2-74-015) Avail: NTIS HC $4.50

Progress is reported on instrumentation and techniques for the measurement of air pollutants. The techniques and instrumentation that have been promulgated by EPA along with air pollution standards are included along with those that are in use by EPA for developing standards, and those that are being developed by EPA to meet current or future needs. Descriptions of these techniques are brief but reference to the detailed procedures are given. Author

N74-23053*# National Aeronautics and Space Administration, Washington, D.C.

DEVELOPMENT POSSIBILITIES FOR TOPOGRAPHIC OVERVIEW MAPS (SCALE 1:500,000)

Christian Hermann May 1974 27 p refs Transl. into ENGLISH from Kartographische Machrichten (West Germany), v. 23, no. 4, Aug. 1973 p 148-157 plus suppl.
(NASA-TT-F-15703) Avail: NTIS HC $4.50 CSCL 08B

Two examples of traditional map concepts for a scale of 1:500,000 are given. Emphasis is placed on topographical overview maps exemplified by the relief toned Swiss Manier. A suggestion is made for a modified Swiss Manier on a scale of 1:500,000 for other climatic regions. The possibility of improving existing topographical overview maps through satellite photointerpretation and automated production processes is discussed. D.L.G.

N74-23054*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

ANALYSIS OF THE FEEDBACK SYSTEM IN A NONINTRUSIVE DYNAMIC FLOWMETER FOR MEASURING POGO OSCILLATIONS

William G. Chapin [1974] 43 p refs
(NASA-TM-X-71962) Avail: NTIS HC $3.25 CSCL 14B

Equations were developed which describe the closed loop feedback system operation of a proposed ultrasonic, dynamic, nonintrusive flowmeter whose design is based on a constant phase, voltage controlled frequency feedback concept. These equations are based on linear feedback system theory. The time constant of a low pass filter is taken into account. The equations show that the larger the open loop gain, the smaller the error due to fluctuations in the speed of sound and the smaller the effective time constant. Author

N74-23055# National Aerospace Lab., Tokyo (Japan).

AN ANALYSIS OF THE EQUATION OF MOTION FOR ROTARY-DRIVE VIBRATORY-OUTPUT GYROS

Hiroshi Yamada Oct. 1973 10 p refs In JAPANESE; ENGLISH summary
(NAL-TR-337) Avail: NTIS HC $4.00

The equations were analyzed by dividing the solutions obtained into separate complex frequencies which were assumed to vary slowly with time in the vicinity of certain constant frequencies. The analysis is constructed so that the physical concept is clarified and so that it can also be applied to a system in which the damping factor is extremely large in comparison with the vibrating system. The rate gyro and the two-degree-of-freedom gyro were analyzed by solving the nonlinear equations using the feedback theory. Author

N74-23056# Technisch Physisch Dienst TNO-TH, Delft (Netherlands). Dept. of Instrumentation.

EVALUATION OF EIGHT TYPES OF Si-SEMICONDUCTOR LIGHT DETECTORS

C. W. DeBoom, W. H. Havens, K. Moddemeyer, and P. J. Oprel 1 Jun. 1973 390 p refs
(Contract ESTEC-1487/71)
(ESRO-CR(P)-359; Rept-111.575) Avail: NTIS HC $22.50

Eight types of silicon photodetectors were evaluated for application in satellite-borne star mappers. Measurements were performed on the electrical circuit parameters, optical properties, and noise behavior of the photodetectors. General results obtained from the evaluation are the validity of an equivalent circuit describing the electrical behavior of an actual silicon p-n junction diode, and a model describing the noise behavior of the photodetectors as a function of the parameters of the electrical equivalent circuit. For use in a system where low-noise performance is required, and the detector is used in the photovoltaic mode, in combination with a current-to-voltage operational amplifier, such as the starmapper system, an order of preference is given, and 3 photodetectors are selected. ESRO

N74-23057# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Dept.

OPERATING PROCEDURE DB-100. MANUAL FOR INFRARED REFLECTIVITY MEASUREMENTS WITH THE GIER-DUNKLE DB-100 INFRARED REFLECTOMETER

E. Sluyter 29 Oct. 1973 5 p
(FOK-RV-73-125) Avail: NTIS HC $4.00

A manual is presented for infrared reflectance measurements using the Gier-Dunkle DB-100 infrared reflectometer. ESRO

N74-23058# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Dept.

OPERATING PROCEDURE MS 251. MANUAL FOR TOTAL SOLAR ENERGY REFLECTANCE MEASUREMENTS WITH THE GIER DUNKLE MS 251 MOBILE SOLAR REFLECTOMETRY

E. Sluyter 29 Oct. 1973 5 p
(FOK-RV-73-126) Avail: NTIS HC $4.00

The purpose of this mobile reflectometer is to measure the reflectance of a surface for solar energy above earth's atmosphere. The reflectometer is composed of a detection head and a portable cabinet with electronic power supply and readout systems. In the detection head radiation from a xenon lamp is filtered and led into an integrating sphere. When the operation directs this radiation onto a surface place over the sample port, the detector provides an output proportional to the amount of reflected radiation. This output is read off the indicating potentiometer in the cabinet. ESRO

N74-23059# Medical Physics Inst. Utrecht (Netherlands).
INVESTIGATION OF THE PROPERTIES OF PIEZOELECTRIC TRANSDUCERS USED IN ULTRASONIC VISUALIZATION SYSTEMS M.S. Thesis - Eindhoven Univ. of Tech.
W. J. Kooij, J. C. Somer, and W. A. Oosterbaan Jan. 1973 114 p refs
(TNO-MFI-2.4.121/1) Avail: NTIS HC $8.75

The transmittingreceiving probe of an electronic sector scan system for ultrasonic diagnosis of human tissues is discussed. The probe is an array-transducer capable of converting electrical energy into mechanical energy and vice versa. The possibility of obtaining an improved electro-acoustical power transfer from the transmitter to the acoustic medium, as well as the generation of ultrasonic pulses with a very short duration, was investigated. ESRO

N74-23060# European Space Research Organization, Paris (France).
PARASITIC ELECTROSTATIC FORCES ACTING ON A PROOF MASS IN SUSPENSION
J.-L. Boulay, J. Maulard et al Feb. 1974 68 p refs Transl. into ENGLISH of Forces Electrostatiques Parasites sur une Masse d'Epreuve en Impesanteur, ONERA-NT-197, ONERA, 1972
(ESRO-TT-22; ONERA-NT-197) Avail: NTIS HC $6.50

The development of ultrasensitive accelerometers used in spacecraft entailed the study of the very weak parasitic forces acting on the proof mass of these instruments, in particular those of electrostatic origin. The latter are due either to random distribution of the electron ionization potentials on the surfaces of the proof mass and the accelerometer cage, or to electrostatic charges created on the proof mass by the Volta effect during contact with the cage. These phenomena and the measurements carried out are described and analyzed, viewing the variations in the ionization potentials and the values of the charges on the metals making up the detecting elements of the accelerometers. Author (ESRO)

N74-23061# Naval Ship Research and Development Center, Bethesda, Md.
TECHNIQUE FOR MEASURING THE DYNAMIC YOUNG'S MODULUS AND LOSS FACTOR Final Report
Gerald R. Castellucci Jan. 1974 32 p refs
(SF43452)
(AD-775285; NSRDC-4149) Avail: NTIS CSCL 14/2

As a part of an extensive program for measuring acoustical properties of polymeric materials, equipment has been designed and set up to measure the dynamic Young's modulus of stiff materials with low acoustic dissipation. Both the elastic modulus and the loss factor are obtained. The method described is based on the excitation of longitudinal resonances in a suspended uniform thin rod having free-free end conditions. For samples of actual material, the results must be corrected for the effect of the radial inertia of the bar and the effects of the measurement equipment on the results. The properties of very lossy or limp materials are measured more conveniently by other techniques. Author (GRA)

N74-23062# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MECHANICAL AND ELECTRONIC SYSTEMS OF A GRAVIMETER
G. P. Arnautov, L. D. Gik, E. N. Kalish, I. S. Malyshev, and Yu. F. Stus 30 Jan. 1974 20 p refs Transl. into ENGLISH from the book "Izmerenie Absolyutnogo Znacheniya Gravitatsionnogo Uskoreniya" USSR, 1972 p 13-26
(AD-774384; FTD-HT-23-765-74) Avail: NTIS CSCL 08/5

The report discusses design of a gravimeter. GRA

N74-23063# Calspan Corp., Buffalo, N.Y.
RAPID RESPONSE ENTHALPY PROBE DEVELOPMENT Final Report, Jul. 1971 - Jul. 1973
F. A. Vassallo Dec. 1973 71 p refs
(Contract F33615-71-C-1943; AF Proj. 7063)
(AD-776070; ARL-73-0183) Avail: NTIS CSCL 14/2

A study is reported in which further development and test of rapid-response total calorimetric probes are performed. Stagnation enthalpy is obtained in a very few milliseconds by performing a heat balance on an ingested gas sample. The basic objective of the study was to perform research leading to the development of rapid-response probes which can measure the total enthalpy distribution of air flows under conditions of high temperature and pressure. Results of both low and high temperature tests of the diluent probe are given and possible future modifications are described. (Modified author abstract) GRA

N74-22935 European Space Research Organization, Paris (France).
TRIGGERING DEVICE FOR THE OPTIMUM RECORDING OF VARIABLE PHENOMENA
Georges Baudin *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 91-93 Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 51-52 (For availability see N74-22928 14-12)

N74-23014 Norwegian Defence Research Establishment, Kjeller.
TYRO: A GYRO REFERENCE PLATFORM FOR SOUNDING ROCKETS
T. Gerhardsen and H. K. Johansen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 269-273 (For availability see N74-22980 14-13)

N74-23211 Joint Publications Research Service, Arlington, Va.
ON THE QUESTION OF COMPENSATING THE SYSTEMATIC ERROR OF A GRAVIMETER
A. P. Filimonov *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 69-74 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 12, 1973 p 61-64 (For availability see N74-23200 14-21)

N74-23227* Kanner (Leo) Associates, Redwood City, Calif.
ON THE ULTRASONIC HOLOGRAPHY
Jerzy K. Zieniuk *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 1-6 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 13-19 (For availability see N74-23226 14-23)
CSCL 20A

N74-23228* Kanner (Leo) Associates, Redwood City, Calif.
METHOD OF VIBRATION ANALYSIS USING HOLOGRAPHIC INTERFEROMETRY AND HETERODYNE OPTICAL DETECTION
V. I. Vlad, J. Maurer, and D. Popa *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 7-14 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 21-27 (For availability see N74-23226 14-23)
CSCL 14E

N74-23231* Kanner (Leo) Associates, Redwood City, Calif.
PORTABLE APPARATUS WITH CRT DISPLAY FOR NONDESTRUCTIVE TESTING OF CONCRETE BY THE ULTRASONIC PULSE METHOD
G. Manta, Y. Gurau, P. Nica, and I. Facacaru *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 27-32 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 45-50 (For availability see N74-23226 14-23)
CSCL 14B

N74-23232* Kanner (Leo) Associates, Redwood City, Calif.
ELECTRONIC POWER GENERATORS FOR ULTRASONIC FREQUENCIES

D. Ciovica *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 33-39 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 53-60 (For availability see N74-23226 14-23)
CSCL 14B

N74-23233* Kanner (Leo) Associates, Redwood City, Calif.
LABORATORY ULTRASONIC GENERATOR
C. Tudose and F. Dobrescu *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 40-52 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 63-78 (For availability see N74-23226 14-23)
CSCL 14B

N74-23237* Kanner (Leo) Associates, Redwood City, Calif.
DEVICE FOR RECORDING THE 20 Hz - 200 KHz SOUND FREQUENCY SPECTRUM USING TELETRANSMISSION
I. Baciu *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 67-70 ref Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 97-100 (For availability see N74-23226 14-23)
CSCL 14B

N74-23255* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS AND SYNTHESIS OF A FLUID SONIC PULSE SYSTEM
M. Boita *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 177-182 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 227-231 (For availability see N74-23226 14-23)
CSCL 14B

N74-23381 Osservatorio Astrofisico di Arcetri, Florence (Italy).
THE MICROMETEOROLOGICAL INSTRUMENTS FOR THE JOSO 1971 SITE-TESTING CAMPAIGN IN LAMPIONE
R. Barletti, M. Meco, and S. Paloschi *In its* Solar Site Testing Expeditions [1973] p 53-64 refs (For availability see N74-23379 14-30)

N74-23485 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.
PROGRAMMING THE NAE FLYING SPOT SCANNER/ANALYSER
H. N. C. Lyster *In* Natl. Res. Council of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Est., 1 Jan. - 31 Mar. 1974 31 Mar. 1974 p 11-23 (For availability see N74-23483 14-34)

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-23064* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
BONDED JOINT AND METHOD Patent
John B. Sainsbury-Carter, inventor (to NASA) (United Aircraft Corp., Stratford Conn.) Issued 7 May 1974 3 p Filed 18 Sep. 1972 Supersedes N73-10499 (11 - 01, p 0061) Sponsored by NASA
(NASA-Case-LAR-10900-1; US-Patent-3,809,601; US-Patent-Appl-SN-290021; US-Patent-Class-161-116) Avail: US Patent Office CSCL 13H

An improved joint is described for reducing the peak shear stress in adhesive bonds when adhesives are used to bond two materials which are in a lapped relationship and which differ in value of modulus of elasticity. An insert placed between the adhesive and one of the two materials acts to cushion the discontinuity of material stiffness thereby reducing the peak shear stress in the adhesive bond.
Official Gazette of the U.S. Patent Office

N74-23065* National Aeronautics and Space Administration. Pasadena Office, Calif.
SCANNING NOZZLE PLATING SYSTEM Patent
Gerald D. Oliver, inventor (to NASA) (JPL) Issued 14 May 1974 4 p Filed 28 Jun. 1972 Supersedes N72-28507 (10 - 19, p 2570) Sponsored by NASA
(NASA-Case-NPO-11758-1; US-Patent-3,810,829; US-Patent-Appl-SN-266913; US-Patent-Class-204-222) Avail: US Patent Office CSCL 13H

A plating system is described in which a substrate to be plated is supported on a stationary platform. A nozzle assembly with a small nozzle is supplied with a plating solution under high pressure, so that a constant-flow stream of solution is directed to the substrate. The nozzle assembly is moved relative to the substrate at a selected rate and movement pattern. A potential difference (voltage) is provided between the substrate and the solution in the assembly. The voltage amplitude is modulated so that only when the amplitude is above a minimum known value plating takes place.
Official Gazette of the U.S. Patent Office

N74-23066* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LIGHT SHIELD AND COOLING APPARATUS Patent
Thomas G. Meador, Jr., inventor (to NASA) Issued 14 May 1974 4 p Filed 10 Nov. 1972 Supersedes N73-13474 (11 - 04, p 0426)
(NASA-Case-LAR-10089-1; US-Patent-3,811,044; US-Patent-Appl-SN-305638; US-Patent-Class-240-47; US-Patent-Class-353-54; US-Patent-Class-353-61) Avail: US Patent Office CSCL 20F

A light shield and cooling apparatus was developed for a high intensity ultraviolet lamp including water and high pressure air for cooling and additional apparatus for shielding the light and suppressing the high pressure air noise.
Official Gazette of the U.S. Patent Office

N74-23067 Rensselaer Polytechnic Inst., Troy, N.Y.
ON THE BUCKLING STABILITY OF A ROTATING HOLLOW BALL BEARING Ph.D. Thesis
Mario Pablo Rivera 1973 118 p
Avail: Univ. Microfilms Order No. 74-5155

The general equations for a rotating body of revolution to be viewed as a roller bearing are developed within the assumptions of shallow shells and quasisteady conditions. The resulting equations are specialized to cylindrical and spherical geometries. Two submodels are considered for the study of local deformation behavior near the outer contacting point: (1) the spherical cap and (2) the slightly curved panel. The resulting equations for the slightly curved panel case are solved by means of an ordinary perturbation technique. The overall deformation pattern and the critical domain for the slightly curved panel submodel seem to indicate that the Koiter-Budiansky buckling and postbuckling theories govern the stability performance of these types of rolling elements.
Dissert. Abstr.

N74-23068* National Aeronautics and Space Administration. Pasadena Office, Calif.
ROCK SAMPLING Patent
Philip Blum, inventor (to NASA) (Natl. Res. Corp., Cambridge, Mass.) Issued 20 Sep. 1971 4 p Filed 6 Aug. 1968 Continuation-in-part of US Patent Appl. SN-611414, filed 24 Jan. 1967 Sponsored by NASA Prepared for JPL
(NASA-Case-XNP-10007-1; US-Patent-3,606,470; US-Patent-Appl-SN-768942; US-Patent-Class-299-67; US-Patent-Appl-SN-611414) Avail: US Patent Office CSCL 13I

An apparatus for sampling rock and other brittle materials and for controlling resultant particle sizes is described. The device includes grinding means for cutting grooves in the rock surface and to provide a grouping of thin, shallow, parallel ridges and cutter means to reduce these ridges to a powder specimen. Collection means is provided for the powder. The invention relates to rock grinding and particularly to the sampling of rock specimens with good size control.
Official Gazette of the U.S. Patent Office

N74-23069* National Aeronautics and Space Administration. Pasadena Office, Calif.
ROCK SAMPLING Patent
Philip Blum, inventor (to NASA) (Natl. Res. Corp., Cambridge, Mass.) Issued 12 Oct. 1971 6 p Filed 11 Sep. 1969 Continuation-in-part of abandoned US Patent Appl. SN-611414, filed 24 Jan. 1967 Sponsored by NASA Prepared for JPL
(NASA-Case-XNP-09755; US-Patent-3,612,030; US-Patent-Appl-SN-857241; US-Patent-Class-125-1; US-Patent-Class-125-3; US-Patent-Class-299-86; US-Patent-Class-51-283; US-Patent-Appl-SN-611414) Avail: US Patent Office CSCL 13I

A method for sampling rock and other brittle materials and for controlling resultant particle sizes is described. The method involves cutting grooves in the rock surface to provide a grouping of parallel ridges and subsequently machining the ridges to provide a powder specimen. The machining step may comprise milling, drilling, lathe cutting or the like; but a planing step is advantageous. Control of the particle size distribution is effected primarily by changing the height and width of these ridges. This control exceeds that obtainable by conventional grinding.
Official Gazette of the U.S. Patent Office

N74-23070* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TWO SPEED DRIVE SYSTEM Patent
John L. Burch, inventor (to NASA) Issued 25 Jul. 1972 6 p Filed 31 Dec. 1970 Supersedes N72-20463 (10 - 11, p 1481)
(NASA-Case-MFS-20645-1; US-Patent-3,678,771; US-Patent-Appl-SN-103091; US-Patent-Class-74-217R) Avail: US Patent Office CSCL 13I

A two speed drive system for a wheel of a vehicle by which shifting from one speed to the other is accomplished by the inherent mechanism of the wheel is described. A description of the speed shifting operation is provided and diagrams of the mechanism are included. Possible application to lunar roving vehicles is proposed.
P.N.F.

N74-23071*# National Aeronautics and Space Administration. Pasadena Office, Calif.
AN IMPROVED GENEVA MECHANISM Patent Application
Robert H. Summers (JPL) and Ralph L. Kenney, inventors (to NASA) (JPL) Filed 2 Nov. 1973 16 p
(Contract NAS7-100)
(NASA-Case-NPO-13281-1; US-Patent-Appl-SN-412079) Avail: NTIS HC $4.00 CSCL 13I

The invention is characterized by a driven star-wheel mounted on a shaft in contiguous relation with a restraining cam of a star-wheel driver. The star-wheel includes several radially extended slots separated by a segmented cam follower surface, including uniform incurved segments. The incurved surfaces of the star-wheel are sequentially engaged by an excurved segment of the surface of the restraining cam. A pair of antifriction rollers are mounted at each end of the excurved cam surface through which a rolling engagement is established between the cam and the star-wheel. By including antifriction rollers at the opposite ends of the excurvated segment of the restraining cam, freezing of the star-wheel to the restraining cam is precluded.
NASA

N74-23072# United Nations Development Program.
CARBONIZATION AND HYDROGENATION OF COAL
1973 146 p refs
(ID/86) Avail: NTIS MF $1.45; United Nations, Sales Section, New York or Geneva HC $3.00, Sales No.: E.72.II.B.26

Coal treatment processes are described in relation to their economic and utilitarian viability in developing countries. Carbonization, hydrogenation, and the Fischer-Tropsch gasification processes for making oils, chemicals, and gas from coal are described along with plant layouts. The processes are compared on the basis of product properties and uses, and the internal and external economic factors associated with production. Capital investment manpower, coal reserves, and market considerations are discussed, and the developing countries for which coal treatment industries might be suited are listed.
A.A.D.

N74-23073# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
PHYSICAL BASIS OF ADHESION Final Report
E. Orowan Jul. 1973 10 p
(Contract F44620-72-C-0066; AF Proj. 6813)
(AD-774538; AFOSR-74-0150TR) Avail: NTIS CSCL 11/9

This paper discusses adhesion in relation to fracture of glassy polymers. Polystyrene is examined for crack propagation and crazing.
GRA

N74-23074# California Univ., Berkeley. Operations Research Center.
INTRODUCTION TO FAULT TREE ANALYSIS
Richard E. Barlow and Chatterjee Purnendu Dec. 1973 48 p refs
(Contracts N00014-69-A-0200-1036; F33615-73-C-4078)
(AD-774072; ORC-73-30) Avail: NTIS CSCL 14/4

Fault tree analysis has proved to be a useful analytical tool for the reliability and safety analysis of complex systems. This is a semi-expository introduction to the mathematics of fault tree analysis. Many of the concepts of coherent structure theory have been used. Bounds on the system reliability when components are dependent (that is, are associated) are given. Algorithms to find the min-cut-sets and related bounds, together with various means for computing the probability of the Top Event are presented. Measures of event importance are discussed. Numerical examples are presented to illustrate the concepts.
Author (GRA)

N74-23075# Westinghouse Astronuclear Lab., Pittsburgh, Pa.
INVESTIGATION OF PARAMETERS INVOLVED IN METAL PROCESSING OPERATIONS Final Report, 16 Dec. 1970 - 15 Oct. 1973
D. J. Abson and F. J. Gurney Dec. 1973 74 p refs
(Contract F33615-71-C-1163; AF Proj. 7351)
(AD-776293; AFML-TR-73-281) Avail: NTIS CSCL 13/8

The report summarizes the findings of several investigations involving the influence of process variables on the production of shapes with specified geometry and controlled microstructure. The studies included: the extrusion consolidation of pre-alloyed metal powders (7075 Aluminum and Rene 95); a refinement of the analysis and application of the ring compression test; the use of hardness testing to evaluate the strength of hot deformed product; investigations of the effect of processing variables on extruded product and extrusion pressures; the fabrication of a heated die forging system and a preliminary investigations of lubricants; an analysis of some published flow stress data for Ti-6Al-4V; studies of grain growth in some titanium-base alloys and a comparison of grain boundary and sub-boundary strengthening in aluminum. (Modified author abstract)
GRA

N74-23076# General Dynamics/Fort Worth, Tex. Convair Aerospace Div.
COMPUTER-AUTOMATED ULTRASONIC INSPECTION SYSTEM FOR AIRCRAFT FORGINGS Annual Technical Report, 1 Jun. 1972 - 1 Jun. 1973
Bill G. W. Yee, Eliot E. Kerlin, and A. H. Gardner Oct. 1973 21 p
(Contract F33615-72-C-1828; AF Proj. 7351)
(AD-775736; FZM-6162; AFML-TR-73-194) Avail: NTIS CSCL 13/8

The work includes the preliminary design of the overall system operation shown by block diagrams of the subsystem functions and operations and timing diagrams for the three modes of ultrasonic inspection: reflection, transmission, and Delta-Scan. Progress to date includes the completion of the design of the X-Y scanner, the purchase of a 4 x 6 x 3-ft tank, and the purchase of the mechanical components, electromechanical controls, and displays necessary for the fabrication of an X-Y scanner capable of operating in the manual or computer controlled mode. The design for the gimbal control is essentially complete with some of the components already in fabrication. A Convair-owned Automation Model UM 771 reflectoscope has been modified to accept programmable gain control from the computer. The electronic circuitries for the gating and computer interfacing have been designed and several have been fabricated. (Modified author abstract)
GRA

N74-23235* Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTIONS TO THE STUDY OF ULTRASONIC MACHINING
G. Savii and T. Iclanzan *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 53-59 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica, Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 81-87 (For availability see N74-23226 14-23)
CSCL 13H

N74-23236* Kanner (Leo) Associates, Redwood City, Calif.
METALWORKING WITH ULTRASONIC ENERGY
I. Sonea and M. Minca *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 60-66 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 89-95 (For availability see N74-23226 14-23)
CSCL 13H

N74-23239* Kanner (Leo) Associates, Redwood City, Calif.
POWDER PRESSING IN A MACROSONIC FIELD
A. Protipopescu, O. Dragan, and D. Ciovica *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 77-83 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 109-115 (For availability see N74-23226 14-23)
CSCL 13H

N74-23241* Kanner (Leo) Associates, Redwood City, Calif.
SOME RESEARCH CONCERNING THE COLD DRAWING OF TUBES ON AN ULTRASONICALLY ACTIVATED PLUG
O. Dragan, D. Ciovica, and S. Novac *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 89-96 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 125-131 (For availability see N74-23226 14-23)
CSCL 13H

N74-23243* Kanner (Leo) Associates, Redwood City, Calif.
ON THE DYNAMIC STABILITY OF THE FOCUS OF DEFORMATION IN THE COLD DRAWING OF TUBES ON AN ULTRASONICALLY ACTIVATED PLUG
O. Dragan, G. Simonescu, S. Novac, and N. Matei *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-15663) Apr. 1974 p 102-111 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 139-148 (For availability see N74-23226 14-23)
CSCL 13H

N74-23244* Kanner (Leo) Associates, Redwood City, Calif.
SOME ASPECTS OF USING ULTRASOUNDS TO IMPROVE SULFUROUS MINERAL FLOTATION TECHNOLOGY
V. P. Mihu and I. Pop *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 112-117 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 151-156 (For availability see N74-23226 14-23)
CSCL 13H

N74-23245* Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTIONS TO STUDY OF THE STABILITY OF THE ELECTRIC WELDING ARC UNDER THE ACTION OF ACOUSTIC PRESSURE
S. Petru *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 118-125 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 159-164 (For availability see N74-23226 14-23)
CSCL 13H

N74-23246* Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTIONS TO THE USE OF MACROSOUNDS FOR BOILER DECRUSTING
C. Bradeteanu *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 126-130 ref Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 167-170 (For availability see N74-23226 14-23)
CSCL 13H

N74-23247* Kanner (Leo) Associates, Redwood City, Calif.
ON PARTICLE MOTION IN AN ELECTRIC WELDING ARC TREATED WITH SONIC OR ULTRASONIC OSCILLATIONS
S. Petru *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 131-138 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 173-178 (For availability see N74-23226 14-23)
CSCL 13/4

N74-23248* Kanner (Leo) Associates, Redwood City, Calif.
CRACKING AND REFORMATION OF SATURATED HYDROCARBONS BY ULTRASOUND IN THE PRESENCE OF WATER
M. R. O. Prudhomme and J. Lefort *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 139-147 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 181-185 (For availability see N74-23226 14-23)
CSCL 13H

N74-23259* Kanner (Leo) Associates, Redwood City, Calif.
ULTRASONIC EXAMINATION OF WELDED JOINTS OF GREAT THICKNESS IN MECHANICAL EQUIPMENT UNDER PRESSURE
N. Emil *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 199-203 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 257-262 (For availability see N74-23226 14-23)
CSCL 14D

N74-23261* Kanner (Leo) Associates, Redwood City, Calif.
INFLUENCE OF ULTRASOUNDS ON ELECTROLYTIC POLISHING
I. Gavrila and N. Liuteanu *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 210-214 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 1973 p 271-275 (For availability see N74-23226 14-23)
CSCL 13H

N74-23265* Kanner (Leo) Associates, Redwood City, Calif.
RESEARCH ON WOOD BENDING IN A MACROSONIC FIELD
J. Filipovici, D. Mihai, S. Mihai, O. Dragan, and S. Ciovica *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 234-237 Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 303-308 (For availability see N74-23226 14-23)
CSCL 13H

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-23077 California Inst. of Tech., Pasadena.
A LASER LIGHT SCATTERING STUDY OF TRANSPORT AND CRITICAL PHENOMENA Ph.D. Thesis
Erdogan Guelari 1973 282 p
Avail: Univ. Microfilms Order No. 73-26463

The intensity and Rayleigh linewidth were measured as a function of temperature and scattering angle of light scattered by concentration fluctuations near the critical point of the binary liquid system. The shear viscosity anomaly was also studied by measuring it as a function of temperature near the critical point. Light scattering techniques were employed to measure the mutual diffusion coefficient D as a function of concentration in ten binary mixtures, and the thermal diffusivity in nine pure liquids and one binary mixture. Turbidity and decay rate of density fluctuations were measured as a function of temperature on the critical isochore

of ethane near the critical point. Calculations were made and values obtained for the diffusion coefficient, intensity, and viscosity, and absolute values were determined for isothermal compressabilities and correlation lengths. Also calculated were values for thermal diffusivity, thermal conductivity, and excess thermal conductivity; all in general agreement with available data.
Dissert. Abstr.

N74-23078 Clark Univ., Worcester, Mass.
TRIPLET STATE QUENCHING IN LONG PULSE FLASH-LAMP-PUMPED DYE LASERS USING POLYACENE ADDITIVES Ph.D. Thesis
J. Michael Drake 1973 180 p
Avail: Univ. Microfilms Order No. 74-9220

Quenching studies using polyacene additives produced a two fold result. First, the use of polyacene additives as triplet quenchers can produce laser efficiencies larger than any additives previously reported. Secondly, the effect of filtering the UV light from the flashlamp not only allows the use of a wide range of new triplet quenchers, but reduces the dye degradation rate.
Dissert. Abstr.

N74-23079 Syracuse Univ., N.Y.
STUDIES OF THE He-Cd(+) METAL-VAPOR LASER Ph.D. Thesis
David Chester Brown 1973 213 p
Avail: Univ. Microfilms Order No. 74-8233

An experimental investigation of the He-Cd(+) laser was undertaken with a view towards studying the cause and suppression of noise impressed upon the the output intensity of the 4416 A, laser transition, and obtaining direct confirmation of the Penning effect as being the basic dominant excitation mechanism for both the 4416 A and 3250 A transitions. The results of this research are the attainment of the lowest noise figure to date (0.14%) (RMS noise/DC level x 100), and successful completion of an adsorption experiment which provides direct confirmation of the Penning effect through the collision process for the 4416 A transition. An undecidable result was obtained for the 3250 A transition because of overlapping of adjacent spectral lines.
Dissert. Abstr.

N74-23080 Florida Univ., Gainesville.
EXCITATION AND IONIZATION OF GASES BY FISSION FRAGMENTS Ph.D. Thesis
Roy Allan Walters 1973 325 p
Avail: Univ. Microfilms Order No. 74-9568

The excitation and ionization produced by fission fragments was investigated to identify basic mechanisms that could be applied to direct nuclear pumping or enhancement of gas lasers. The spectrum obtained from this excitation was qualitatively similar to a glow discharge for argon and helium except for the presence of excited ion species of He II and Ar III. The spectral output from irradiation of 760 torr carbon tetrafluoride provided a band system that is presently unidentified. Pressure dependent relative intensity and excited state density data provide information on state and species kinetics such as formation of molecular ions and their loss mechanisms. Four possible population inversions were identified in Ar II. Boltzmann analysis of the excited states supplied a temperature for each species where the correlation coefficients of the fit lines indicate that the plasmas are typical nonequilibrium cascade systems.
Dissert. Abstr.

N74-23081*# Stanford Univ., Calif. Microwave Lab.
INVESTIGATION OF LASER DYNAMICS, MODULATION AND CONTROL BY MEANS OF INTRA-CAVITY TIME VARYING PERTURBATION Semiannual Status Report, 1 Aug. 1973 - 31 Jan. 1974
S. E. Harris Jan. 1974 40 p refs
(Grant NGL-05-020-103)
(NASA-CR-70059; SASR-20; ML-2259) Avail: NTIS HC $5.00 CSCL 20E

Projects aimed at the generation of tunable visible, infrared, and ultraviolet light, and on the control of this light by means of novel mode-locking and modulation techniques are discussed. During this period the following projects have been active: (1) studies of transient mode-locking of the Nd:YAG laser and the application of short optical pulses; (2) experimental investigations of the Na-Xe excimer laser system; (3) further development of techniques for vacuum ultraviolet holography; and (4) theoretical and initial experimental studies of a new device which should prove very useful for both infrared up-conversion and generation of tunable UV radiation - a two-photon resonantly pumped frequency converter.
Author

N74-23082# Advisory Group for Aerospace Research and Development, Paris (France).
LASER INSTRUMENTATION FOR FLOW FIELD DIAGNOSTICS
J. D. Trolinger (ARO, Inc.), S. M. Bogdonoff, ed. (Princeton, Univ.), and J. A. Smith, ed. Mar. 1974 128 p refs
(AGARDograph-186; AGARD-AG-186) Avail: NTIS HC $9.50 CSCL 20E

An introduction to coherent optics and holography is presented. A discussion of the application of lasers in aerodynamics is presented and examples taken from many different laboratories are included. The use of lasers to complement conventional optical methods is reviewed while more advanced techniques are presented in greater detail. These include new methods in interferometry, holography, and laser Doppler techniques. Author

N74-23083*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
THE OPTICAL PUMPING OF ALKALI ATOMS USING COHERENT RADIATION FROM SEMI-CONDUCTOR INJECTION LASERS AND INCOHERENT RADIATION FROM RESONANCE LAMPS Final Report
Gurbax Singh 1 Jul. 1973 115 p refs
(Grant NGR-21-002-218)
(NASA-CR-139008) Avail: NTIS HC $8.75 CSCL 20E

An experimental study for creating population differences in the ground states of alkali atoms (Cesium 133) is presented. Studies made on GaAs-junction lasers and the achievement of population inversions among the hyperfine levels in the ground state of Cs 133 by optically pumping it with radiation from a GaAs diode laser. Laser output was used to monitor the populations in the ground state hyperfine levels as well as to perform the hyperfine pumping. A GaAs laser operated at about 77 K was used to scan the 8521 A line of Cs 133. Experiments were performed both with neon-filled and with paraflint-coated cells containing the cesium vapor. Investigations were also made for the development of the triple resonance coherent pulse technique and for the detection of microwave induced hyperfine trasistions by destroying the phase relationships produced by a radio frequency pulse. A pulsed cesium resonance lamp developed, and the lamp showed clean and reproducible switching characteristics.
Author

N74-23084*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PRELIMINARY INVESTIGATION OF THE EFFECTS OF DYE CONCENTRATION ON THE OUTPUT OF A MULTIWAVELENGTH DYE LASER
Ivan O. Clark and Lewis G. Burney Apr. 1974 12 p ref
(NASA-TM-X-71966) Avail: NTIS HC $3.00 CSCL 20E

The effects of dye concentration on the output wavelength and energy of a multiwavelength dye laser were investigated. The dyes tested were Coumarin 2 in methyl alcohol and Rhodomine 6G, Acridine Red, and 7-diethylamino-4-methyl Coumarin (7DA 4MC) in ethyl alcohol.
Author

N74-23085# Institut Franco-Allemand de Recherches, St. Louis (France).
DIAGNOSTICS OF THE FLOW VIBRATIONAL ENERGY [LE DIAGNOSTIC DE L'ENERGIE VIBRATIONNELLE DANS UN ECOULEMENT]
S. Bihl and R. Joeckle 9 Feb. 1973 28 p refs In FRENCH
(Contract DRME-72/545)
(ISL-NB-3/73) Avail: NTIS HC $4.50

An annotated bibliography on vibrational energy diagnostics in a flow is presented. It covers 17 references between 1954 and 1969 and deals with gain measurement, automation measurements, thermodynamic temperature light emission/absorption, and Raman effect.
ESRO

N74-23086# ILC Technology, Inc., Sunnyvale, Calif.
OPTICAL PUMPS FOR LASERS, VOLUME 1 Final Report,

17 May 1971 - 16 Jul. 1972
Lowell Noble Oct. 1973 262 p refs
(Contract DAAB07-71-C-0239; DA Proj. 1S7-62703-A-186)
(AD-775400; R-ILC-72-32-Vol-1; ECOM-0239-1-F) Avail: NTIS CSCL 20/6

The objective of this program was to increase the efficiency and reproducibility of optical pumps for Nd:YAG lasers both when new and after 1 million or 10 million pulses. Efficiency was increased by using smaller bore diameters (to 2.5 mm), higher pressures, krypton gas at 10 J, pulse lengths near 100 microsec, cerium-doped quartz envelopes, and a simmer current. Operation with a simmer current increased useful light output by 25% and reduced pulse-to-pulse variability from 0.43% to 0.12%. Lamp life, reproducibility, and efficiency were studied as functions of: precision control of bore diameter, the use of a simmer discharge, the use of cerium-doped quartz envelopes, the employment of fluorescent dye solutions, color center formation, and cooling techniques. (Modified author abstract) GRA

N74-23087# Lockheed Missiles and Space Co., Huntsville, Ala.
CHEMICAL LASER ANALYSIS DEVELOPMENT: VOLUME 2: TWO-DIMENSIONAL FRESNEL INTEGRAL LASER AND MIXING PROGRAM USER'S GUIDE Final Report, 24 Oct. 1972 - 24 Oct. 1973
Juergen Thoenes, Charles South, and David B. Rensch Oct. 1973 89 p refs Prepared in cooperation with Hughes Res. Labs.
(Contract DAAH01-73-C-0232; DA Proj. 1T6-62703-A-308)
(AD-775412; LMSC-HREC-TR-D306900-2; RK-CR-73-2-Vol-2) Avail: NTIS CSCL 20/5

The Two-Dimensional Fresnel Integral Laser and Mixing Program (TDFI-LAMP) is described. This computer program represents a combination of the Hughes: developed Fresnel Integral Computer Program (FICP) and the Lockheed-developed Laser and Mixing Program (LAMP), thereby providing a sophisticated tool for the study of the interrelated gasdynamic and optical properties of chemical laser resonators. Author (GRA)

N74-23088# Lockheed Missiles and Space Co., Huntsville, Ala.
CHEMICAL LASER ANALYSIS DEVELOPMENT: VOLUME 3: LOCKHEED ONE DIMENSIONAL LASER AND MIXING PROGRAM GUIDE Final Report, 24 Oct. 1972 - 24 Oct. 1973
Ronald R. Mikatarian and Larry R. Ring Oct. 1973 53 p refs
(Contract DAAH01-73-C-0232; DA Proj. 1T6-62703-A-308)
(AD-775413; LMSC-HREC-TR-D306900-3; RK-CR-73-2-Vol-3) Avail: NTIS CSCL 20/5

The Lockheed One-Dimensional Laser and Mixing Program (ODLAMP) is described for analyzing multi-species lasing in a chemically reacting one-dimensional stream with mass addition. Mass is assumed to be injected (at a prescribed rate) from each of two separate streams, into a primary lasing stream. Lasing due to P-transitions (i.e., transitions proceeding from (v+1, J-1) to (v, J)) is treated. Both the analysis and computer programs are presented, including an input guide, sample calculation and flow chart. Author (GRA)

N74-23089# Lockheed Missiles and Space Co., Huntsville, Ala.
CHEMICAL LASER ANALYSIS DEVELOPMENT: VOLUME 4: METHOD OF CHARACTERISTICS LASER AND MIXING PROGRAM THEORY AND USER'S GUIDE Final Report, 24 Oct. 1972 - 24 Oct. 1973
Alan W. Ratliff, Juergen Thoenes, and Sheldon D. Smith Oct. 1973 94 p refs
(Contract DAAH01-73-C-0232; DA Proj. 1T6-62703-A-308)
(AD-775414; LMSC-HREC-TR-D306900-4; RK-CR-73-2-Vol-4) Avail: NTIS CSCL 20/5

A new laser and mixing computer program is described which considers the coupling between gasdynamic properties, cavity characteristics, and resulting laser radiation for diffusion-type chemical laser oscillator cavities. The formulation assumes non-uniform mixing with lateral pressure gradients and lasing due to a single transition between the upper and lower laser levels. Excitation of the active medium traversing a Fabry-Perot optical cavity is caused by highly exothermic reactions between gradually mixing reactants discharged from a grid nozzle. Uniform, premixed inviscid laser cavity flows can be investigated as a special case of the more general analysis. Author (GRA)

N74-23090# Lockheed Missiles and Space Co., Huntsville, Ala.
CHEMICAL LASER ANALYSIS DEVELOPMENT. VOLUME 6: SURVEY OF PRESSURE RECOVERY METHODS FOR CHEMICAL LASER APPLICATION Final Report, 24 Oct. 1972 - 24 Oct. 1973
L. Ray Baker, Jr. and John H. McDermit Oct. 1973 54 p refs
(Contract DAAH01-73-C-0232; DA Proj. 1T6-62703-A-308)
(AD-775416; LMSC-HREC-TR-D306900-6; RK-CR-73-2-Vol-6) Avail: NTIS CSCL 20/5

Available data on pressure recovery devices is assembled and analyzed and their suitability assessed for application to chemical laser systems. Performance of unaugmented gasdynamic diffusers are examined and potential devices are reviewed for augmenting (or pumping) the diffuser exhaust gases. Recommendations are made concerning the most attractive pressure recovery technique, and realistic goals for operation of the chemical laser cavity commensurate with pressure recovery technology. Author (GRA)

N74-23091# Lockheed Missiles and Space Co., Huntsville, Ala.
CHEMICAL LASER ANALYSIS DEVELOPMENT: SUMMARY VOLUME Final Report, 24 Oct. 1972 - 24 Oct. 1973
John W. Benefield Oct. 1973 53 p refs
(Contract DAAH01-73-C-0232; DA Proj. 1T6-62703-A-308)
(AD-775417; LMSC-HREC-TR-D306900-S; RK-CR-73-2-S) Avail: NTIS CSCL 20/5

The general objectives of this effort were to improve the analytical tools available for studying chemical lasers and to apply these tools to further the understanding of chemical lasers. Four computer programs are described in the report: (1) One-Dimensional Laser and Mixing Program (ODLAMP); (2) Laser and Mixing Program (LAMP); (3) Two-Dimensional Fresnel Integral Laser and Mixing Program (TDFI-LAMP); and (4) Method-of-Characteristics Laser and Mixing Program (MOC-LAMP). Selected highlights are presented of the computer codes, analyses, results, conclusions and recommendations. The results presented include the effects of fuel/oxidizer ratios, cavity pressure, mixing, optical characteristics, mode of operation, boundary layer and an assessment of the relationship of chemical laser cavity conditions to pressure recovery methods. Author (GRA)

N74-23092# Rockwell International Corp., Canoga Park, Calif. Rocketdyne Div.
HF/DF CHEMICAL LASER COMPONENT PROGRAM Final Report, 15 Sep. 1972 - 15 Sep. 1973
Feb. 1974 26 p
(Contract F29601-72-C-0152; AF Proj. 3326)
(AD-775739; R-9351; AFWL-TR-73-216) Avail: NTIS CSCL 20/5

The objective of this program was to provide the Air Force Rocket Propulsion Laboratory and Air Force Weapons Laboratory new components and/or refurbish existing components for Chemical Laser Test Systems. During the course of the program, two laser nozzle arrays were repaired, a multiple-nozzle block was fabricated to a United States Air Force Academy drawing, a combustor and adapter section was designed and fabricated to be compatible with the Taper Facility at RPL, and a 16:1 area ratio wind tunnel model was designed and fabricated. Author (GRA)

N74-23093# Ohio State Univ., Columbus. ElectroScience Lab.
INVESTIGATION OF LASER PROPAGATION PHENOMENA Final Technical Report
Stuart A. Collins and D. D. Duncan Dec. 1973 30 p refs
(Contract F30602-72-C-0305)
(AD-775738; ESL-3432-7; RADC-TR-74-14) Avail: NTIS CSCL 20/6

The object of the contract has been to provide theoretical studies of selected topics associated with light-beam propagation through a turbulent atmosphere for a program being conducted at the Rome Air Development Center. Among the topics considered have been temporal spectra of atmospherically induced phase difference fluctuations, an analysis of an angle-of-arrival apparatus used at RADC and a study of the Fourier transform image restoration procedure. Previous work is summarized, and new results are added where applicable. Author (GRA)

N74-23094# Systems Control, Inc., Palo Alto, Calif.
FUNDAMENTAL PROBLEMS OF PRECISION ACQUISITION, POINTING, AND TRACKING SYSTEMS Final Report, 1 Dec. 1972 - 30 Nov. 1973
R. T. Curran, R. M. Dressler, and D. S. Spain Nov. 1973 85 p refs
(Contract F44620-73-C-0016)
(AD-776076; AFOSR-74-0348TR) Avail: NTIS CSCL 17/8

The purpose of the study was to investigate the application of modern estimation and control concepts to precision pointing and tracking problems. The investigation included the development of a unified estimator/controller design, the study of various performance measures, and the identification of critical areas for further investigation. The report describes the results of this precision pointing and tracking study. GRA

N74-23095# Army Foreign Science and Technology Center, Charlottesville, Va.
PLASMA BEAM CO2 LASER
D. Yu. Zaroslov, E. K. Karlova, N. V. Karlov, G. P. Kuzmin, and A. M. Prokhorov 10 Jan. 1974 8 p refs Transl. into ENGLISH from Zh. Eksperim. Teor. Fiz. (Moscow), v. 15, no. 11, 1972 p 665-668
(AD-776173; FSTC-HT-23-298-73) Avail: NTIS CSCL 20/5

The article reports on excitation, produced for the first time by a plasmotron, of a CO2 laser, achieved by the injection of plasma beams formed in capillary plasmotrons into the operating volume of the laser. GRA

N74-23096# Hughes Research Labs., Malibu, Calif.
WAVEGUIDE GAS LASERS Final Report, 1 Nov. 1972 - 30 Nov. 1973
Richard Abrams Dec. 1973 62 p refs
(Contract F19628-73-C-0086; AF Proj. 6100)
(AD-776063; AFCRL-TR-74-0014) Avail: NTIS CSCL 20/5

The program is an exploratory study on waveguide gas lasers in general, with an emphasis on waveguide CO2 lasers. The goals of the program were to investigate the operating parameters of waveguide gas lasers, to demonstrate single mode operation of a CO2 waveguide laser over the pressure broadened linewidth; to mode lock the CO2 waveguide laser, and to study mode control of waveguide lasers. Experiments on frequency tuning of the waveguide CO2 laser were performed. An extensive theoretical treatment has been performed on resonators for waveguide lasers. Using a matrix diagonalization technique, the resonator losses and resonator modes for waveguide resonators have been determined. Specific resonator configurations were found which are specifically designed for high transverse mode selectivity. GRA

N74-23097# General Electric Co., Schenectady, N.Y. Corporate Research and Development.
Nd:YAG MINI-FACE-PUMPED LASER (FPL) Final Report, Jun. 1971 - May 1973
Joseph P. Chernoch and William B. Jones Dec. 1973 80 p refs
(Contract F33615-71-C-1761; AF Proj. 5237)
(AD-775746; SRD-73-137; AFAPL-TR-73-446) Avail: NTIS CSCL 20/5

The purpose of this program was to demonstrate the feasibility of extending the Mini-Face-Pumped Laser (FPL) concept to use Nd:YAG as the laser material. The program is divided into 2 parts: the experimental investigation of Nd:YAG Mini-FPL pump cavities, and the theoretical study of the possible application of the Mini-FPL concept to the low power, high efficiency mode of operation required for space communications. Design parameters were generated which are necessary for the construction of YAG Mini-FPLs with specific performances. GRA

N74-23098# Harry Diamond Labs., Washington, D.C.
A REVIEW OF TRANSVERSE AND AXIAL LASER MODES
J. S. Kruger Jul. 1973 19 p refs
(DA Proj. 1T6-1102-A-31C)
(AD-775794; HDL-TM-73) Avail: NTIS CSCL 20/5

The resonant cavity is the prime factor affecting a laser's mode structure. Within the cavity, two types of oscillation can occur - transverse and axial. The axial modes directly affect the degree of monochromaticity, whereas the transverse modes principally affect the beam divergence, spot size, and maximum power density. Both types of modes are considered here. The relationship of resonant frequencies of the laser cavity to axial and transverse modes is explained. Author (GRA)

N74-23099# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ATMOSPHERIC ATTENUATION OF CO LASER RADIATION IN THE REGION 1720/CM TO 2080/CM M.S. Thesis
Walter F. Caldwell Mar. 1974 186 p refs
(AD-775709; GEP/PH/74-3) Avail: NTIS CSCL 20/6

Atmospheric attenuation was studied for 102 different CO laser lines in the region 1720/cm to 2080/cm. The purpose was to determine how the various atmospheric constituents affected the transmittance of these lines. Six model atmospheres, two aerosol models, and the molecular absorption parameters for the lines of water vapor, O3, CO2, N2O, and CO were included. The calculations were done on a CDC 6600 computer. Transmittance curves for the Midlatitude Winter-hazy model, power-on-target curves for six different multi-line CO lasers, and tables of absorption/scattering coefficients for 69 different CO laser lines were computed. (Modified author abstract) GRA

N74-23100# Informatics, Inc., Rockville, Md.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NUMBER 13, JULY - SEPTEMBER 1973
Stuart G. Hibben 23 Jan. 1974 157 p refs
(Contract F44620-72-C-0053; ARPA Order 1622-4)
(AD-776072; AFOSR-74-0357TR) Avail: NTIS CSCL 20/5

This is the Soviet Laser Bibliography for the third quarter of 1973 and is No. 13 in the series on Soviet laser developments. The coverage includes basic research on solid state, liquid, and gas lasers; chemical lasers; theoretical aspects of advanced lasers; components; nonlinear optics, spectroscopy of laser materials; ultrashort pulse generation; crystal growing; and general laser theory. Laser applications are listed under biological effects; communications; computer technology; holography; instrumentation and measurements; beam-target interaction; and plasma generation and diagnostics. Author (GRA)

N74-23101# United Aircraft Corp., East Hartford, Conn.
E-BEAM HCl LASER Semiannual Technical Report, 1 May - 31 Oct. 1973
John A. Shirley, R. J. Hall, and B. R. Bronfin 30 Nov. 1973 25 p refs
(Contract N00014-72-C-0450; ARPA Order 1807)
(AD-776267; UARL-M911340-9) Avail: NTIS CSCL 20/5

The feasibility of producing stimulated emission in the 3 - 5 wavelength band by exciting hydrogen chloride vibrational levels by electron impact is being investigated theoretically and experimentally. Theoretical predictions of electrically pulsed HCl laser performance indicate that gain coefficient in excess of 1%/cm and optical efficiencies in the 20-30 percent range should be realizable in the present experiment. The pulsed HCl laser experiments in progress are described. Author (GRA)

N74-23441 Dornier-System G.m.b.H., Friedrichshafen (West Germany).
FLAW DETECTION BY MEANS OF HOLOGRAPHIC INTERFEROMETRY
Klaus Gruenewald *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 494-502 refs (For availability see N74-23413 14-32)

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-23102 University of Southern Calif., Los Angeles.
METALLURGICAL ASPECTS OF ELECTRO DEPOSITED GOLD Ph.D. Thesis
Peter Sylvester Willcox 1974 158 p
Avail: Univ. Microfilms Order No. 74-9094

Electrodeposited gold foils were examined to determine their structure and mechanical properties. Au and Au-0.4 wt. % Ni foils were produced from acid-citrate electrolytes at a current density of 5 amps/ft sq cm with moderate agitation. Pure gold was found to deposit epitaxially onto the Cu substrates. The initial texture changed from a strong <100> orientation to a weak <311> orientation as thickness increased. The grain size varied from 0.1 microns to 10 microns. Normal lattice defects were observed. The surface features of the deposits coarsened as thickness increased. Annealing pure gold deposits for one hour at 300 C caused a reduction in microhardness. Nickel codeposited with gold upon addition of nickel citrate to the electrolyte. The grain size was refined to about 0.03 microns. Numerous voids were present with void diameters of 0.005 microns and smaller. Dissert. Abstr.

N74-23103 Florida Univ., Gainesville.
THE MICROSTRUCTURAL EVOLUTION OF ALUMINUM DURING THE COURSE OF HIGH TEMPERATURE CREEP Ph.D. Thesis
Richard Grant Connell, Jr. 1973 553 p
Avail: Univ. Microfilms Order No. 74-9590

Grain boundary serrations formed during the hot creep of aluminum are the result of macroscopic shearing which occurs along the boundaries of subgrain rows. This shearing is cooperative across grain boundaries. Shear along the boundaries separating subgrain rows and formation of dentate grain boundary serrations commences concurrently with the onset of tertiary creep. Further, subboundary shearing is viewed as a recovery process. Therefore, it is proposed that an additional amount of recovery associated with sub-boundary shearing contributes to an accelerating creep rate and the beginning of third-stage creep. Dissert. Abstr.

N74-23104 Saskatchewan Univ., Saskatoon.
RELATIONS BETWEEN MICROSTRUCTURE, MECHANICAL PROPERTIES AND FRACTURE MORPHOLOGY OF AISI 4140 STEEL Ph.D. Thesis
Ming Wah Lui 1973 257 p
Avail: Univ. Microfilms Order No. 74-9517

The results and observations of an investigation concerning the tempered microstructure, mechanical properties, fatigue behaviour and static and fatigue fracture morphology of a high-strength low-alloy steel, AISI 4140, and the inter-relations between them are discussed. The ultimate tensile strength (UTS), yield strength (YS), fatigue limit and fatigue ratio of this material were found, as expected to depend strongly on tempering temperature. While the first three parameters decreased with tempering temperature, fatigue ratio increased throughout from as-quenched to spheroidized steel. The lower yield strength and lower fatigue limit observed in as-quenched material was attributed to the presence of residual stresses resulting from quenching. Both carbide shape and size varied with tempering temperature. For a given shape, the largest dimension of carbide particles increased linearly with tempering temperature. This relationship was observed to hold in materials tempered below 300 C and above 550 C for plate-shaped and spherical carbides, respectively. Dissert. Abstr.

N74-23105+ Societe Nationale Industrielle Aerospatiale, Paris (France). Direction du Controle Qualite.
ELECTRON MICROSCOPE EXAMINATION OF FATIGUE RUPTURE EN FATIGUE A L'AIDE DU MICROSCOPE ELECTRONIQUE SUR ALLIAGE LEGER ET SUR ALLIAGE DE TITANE COMPTE RENDU DE FIN DE CONTRAT]
G. Sertour and P. LeGall Jun. 1973 61 p In FRENCH
(Contract DGRST-71-7-3079)
Avail: NTIS HC $6.25

A number of IRWIN test bars was tested and the fatigue striation interlines counted with an electron microscope to determine the instantaneous crack propagation velocity, the total propagation cycle number, and the load of the piece. The experimental results are discussed with regard to thickness, frequency, and load. It is shown that, at room temperature, the frequency has no influence while the piece thickness is an important parameter. Maximum interstriation distance is around two microns. A strong correlation exists between macroscopic propagation velocity and interstriation distance and between cycle number and striation number. ESRO

N74-23106+ Societe de Recherche en Matiere de Micromoteurs Electriques, Besancon (France).
PRODUCTION FROM A SINGLE ROUGH-FORGE OF A MECHANICAL PIECE WITH BOTH MAGNETIC AND AMAGNETIC ZONES. APPLICATION TO MICROMOTOR STATORS Final Report [OBTENTION, A PARTIR D'UNE EBAUCHE UNIQUE, D'UNE PIECE MECANIQUE COMPORTANT DES ZONES MAGNETIQUES ET D'AUTRES NON MAGNETIQUES. APPLICATION A LA REALISATION DE STATORS DE MICROMOTEURS COMPTE RENDU DE FIN DE CONTRAT]
26 Jun. 1973 19 p In FRENCH
(Contract DGRST-71-7-2-900)
Avail: NTIS HC $4.00

Various methods for obtaining an air integrated magnetic circuit with applications to micromotor stators are presented. The objective is to find a preferential path for the magnetic field, in a thin metallic plate, without mechanical discontinuity. The local surface diffusion has a great influence on the Curie temperature of the magnetic circuit. For Ni-Fe 64/36, the Ni concentration is locally reduced to around 28% by diffusion of Fe at 1200C. For a Fe-Ni 50/50 to 20/80, Cr is diffused at 1200C unitl a concentration of 13 to 20% is reached. The chromium is electrodeposited on zone unprotected by photosensitive varnish. The main limitations of the method are discussed with emphasis on the depth of the integrated magnetic circuit, which is always less than 50 microns. Author (ESRO)

N74-23107*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SURFACE TOPOGRAPHICAL EFFECTS ON THE STRUCTURAL GROWTH OF THICK SPUTTERED METAL AND ALLOY COATINGS
T. Spalvins and W. A. Brainard 1974 28 p refs Presented at 17th Tech. Conf. of the Soc. of Vacuum Coaters, Detroit, 1-2 May 1974
(NASA-TM-X-71531 ; E-7655) Avail: NTIS HC $4.50 CSCL 11D

Thick sputtered S-Monel, silver, and 304 stainless steel coatings were deposited on mica and metal substrates with various surface finishes to investigate the structural growth of the coating by scanning electron microscopy. The geometry and the surface structure of the nodules are characterized. Compositional changes within the coating were analyzed by X-ray dispersion microscopy. Defects in the surface finish (i.e., scratches, inclusions, etc.) act as preferential nucleation sites and form isolated and complex nodules and various surface overgrowths in the coating. The nodule boundaries are very vulnerable to chemical etching and these nodules do not disappear after full annealing. Further, they have undesirable effects on mechanical properties; cracks are initiated at the nodules when the coating is stressed by mechanical forces. These effects are illustrated by micrographs. Nodular growth within a coating can be minimized or eliminated by reducing the surface roughness. Author

N74-23108# Advisory Group for Aerospace Research and Development, Paris (France).
METALLURGICAL ASPECTS OF FATIGUE AND FRACTURE

(AGARD-R-610) Avail: NTIS HC $7.75

The proceedings of a conference to investigate the fatigue and fracture behavior of aerospace structural alloys are presented. The effect of heat treatment to prevent stress corrosion was analyzed to determine possible changes in the mechanical properties of the materials. The subjects discussed include the following: (1) metallurgical aspects of fatigue and fracture toughness, (2) developments in fatigue and fracture, (3) thermomechanical procedures to improve the properties of high strength aluminum, magnesium, zinc, copper alloys, and (4) the influence of microstructure on the growth of fatigue cracks. For individual titles, see N74-23109 through N74-23112.

N74-23109 Royal Aircraft Establishment, Farnborough (England). Materials Dept.

THE METALLURGICAL ASPECTS OF FATIGUE AND FRACTURE TOUGHNESS

P. J. E. Forsyth *In* AGARD Met. Aspects of Fatigue and Fracture Toughness Dec. 1973 p 1-22 refs (For availability see N74-23108 14-17)

An analysis of the cause of fatigue cracks in materials after a period of repeated stressing is presented. The effects of crystal structure and slip plane cracks are discussed. The application of thermomechanical treatment for improved mechanical properties is described. The effects of anisotropy of micro and macro structure are reported with respect to total fatigue life and crack propagation rates. The fracture toughness of materials is analyzed to show the effects of crystal structure and metal working. Mathematical models are developed to express fracture toughness and plastic deformation. Author

N74-23110 Connecticut Univ., Storrs.

SOME RECENT DEVELOPMENTS IN FATIGUE AND FRACTURE

A. R. Rosenfeld and A. J. McEvily (Battelle Columbus Labs.) *In* AGARD Met. Aspects of Fatigue and Fracture Toughness Dec. 1973 p 23-54 refs (For availability see N74-23108 14-17)

The microstructural origins of the fracture resistance of high strength steels are analyzed. Curves are presented to show schematic crack growth versus stress intensity. The mechanisms considered are fatigue cracking and stress corrosion cracking. Both phenomena exhibit three stages of crack growth as follows: (1) a threshold below which crack growth is not detected, (2) a steady state region, constant velocity for environmental attack and power-law behavior for fatigue, and (3) an instability characterized by the fracture toughness for plane strain, thick section behavior. Author

N74-23111 Istituto Sperimentale del Metalli Leggeri, Novara (Italy).

IMPROVEMENT OF THE PROPERTIES OF HIGH STRENGTH Al-Zn-Mg-Cu ALLOYS BY THERMOMECHANICAL PROCEDURES

E. DiRusso and S. Signoretti (Aeron. Militare Italiana) *In* AGARD Met. Aspects of Fatigue and Fracture Toughness Dec. 1973 p 55-76 refs (For availability see N74-23108 14-17)

A thermomechanical processing technique for producing plates and forgings of 7000 series alloys (7075, 7049, 7475, 7050, etc.) showing a less transverse effect than similar conventionally processed materials was developed. This procedure, called Intermediate Thermomechanical Treatments (ITMT), is based on a combination of warm deformations and heat treatments which involve the recrystallization of the ingot in small equiaxed grains in an intermediate (or final) stage of the working. As a result of the processing, the alloys exhibit better ductility, toughness and stress-corrosion properties, for a given strength, than conventionally processed materials, mainly in the short transverse direction. Moreover, it has been found that the contemporary application of ITMT and final (FTMT) thermomechanical treatments of T-AHA type, which, as is known, cause a super-hardening effect with an acceptable loss in ductility, may lead to decidedly new products with properties that are much superior to those of commercial traditional products. Author

N74-23112 PSI-Trans Corp., El Segundo, Calif.

INFLUENCE OF MICROSTRUCTURE ON THE GROWTH OF FATIGUE CRACKS

G. Sertour and C. Bathias *In* AGARD Met. Aspects of Fatigue and Fracture Toughness Dec. 1973 p 77-90 refs (For availability see N74-23108 14-17)

The application of the failure mechanism concepts to the development of fatigue induced cracks is discussed. The influence of microstructure on the propagation of fatigue induced cracks is analyzed. The metallurgic parameters which play a part at the very level of crack propagation mechanisms are examined. It is stated that the most important parameter which governs the development of fatigue induced cracks is the nature of the plastic deformations which occur at the crack tip. Such deformations are essentially related to the slip character and to the stacking fault energy. The influence of structure on fatigue induced crack development is reviewed with emphasis on the formation of striations and on the environment/structure interaction on crack growth. Author

N74-23113*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF COATED COLUMBIUM AND TANTALUM ALLOYS IN PLASMA ARC REENTRY SIMULATION TESTS

Stanley R. Levine and John P. Merutka Washington May 1974 50 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland

(NASA-TN-D-7617; E-7673) Avail: NTIS HC $3.25 CSCL 11F

The evaluation of coated refractory metals screened in stagnation model plasma arc tests is reported. Columbium alloys FS-85, C-129Y, and Cb-752 coated with Si-20Cr-20Fe (R512E) were tested at 1390 C. Three silicide coatings on Ta-10W were tested at 1470 C. Half-hour cycles and a 6500 N/sqm stagnation pressure were used. The best R512E coated columbium alloy was FS-85 with first local coating breakdowns occurring in 12 to 50 cycles. At coating defects, low metal recession rates (0.005 mm/min) were generally observed on coated columbium alloys while high rates (0.15 mm/min) were observed on coated Ta-10W. Coated columbium suffered large emittance losses (to below 0.7) due to surface refractory metal pentoxide formation. Author

N74-23114*# California Univ., Los Angeles. School of Engineering and Applied Science.

THE EFFECT OF YTTRIUM AND THORIUM ON THE OXIDATION BEHAVIOR OF Ni-Cr-Al ALLOYS Interim Summary Report

Arun Kumar, M. Nasrallah, and D. L. Douglass Washington NASA May 1974 44 p refs

(Grant NGR-05-007-352)

(NASA-CR-2422) Avail: NTIS HC $3.25 CSCL 11F

The effect of quaternary additions of 0.5% Y, 0.5 and 1.0% Th to a base alloy of Ni-10CR-5Al on the oxidation behavior and mechanism was studied during oxidation in air over the range of 1000 to 1200 C. The presence of yttrium decreased the oxidation kinetics slightly, whereas, the addition of thorium caused a slight increase. Oxide scale adherence was markedly improved by the addition of the quaternary elements. Although a number of oxides formed on yttrium containing alloys, quantitative X-ray diffraction clearly showed that the rate-controlling step was the diffusion of aluminum through short circuit paths in a thin layer of alumina that formed parabolically with time. Although the scale adherence of the yttrium containing alloy was considerably better than the base alloys, spalling did occur that was attributed to the formation of the voluminous YAG particles which grew in a mushroom-like manner, lifting the protective scale off the subrate locally. The YAG particles formed primarily at grain boundaries in the substrate in which the yttrium originally existed as YNi9. Author

N74-23115*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECTS OF SIGMA-PHASE FORMATION ON SOME MECHANICAL PROPERTIES OF A WROUGHT NICKEL-BASE SUPERALLOY (IN-100)

Robert L. Dreshfield and Richard L. Ashbrook Washington May 1974 25 p refs

(NASA-TN-D-7654; E-7723) Avail: NTIS HC $3.00 CSCL 11F

The effect of sigma phase formation on an extruded and forged nickel base superalloy with the composition of the casting alloy IN-100 was studied. By adding only aluminum and titanium to remelt stock, three compositions were produced which had varying propensities for sigma formation. These compositions were given a four step heat treatment and were stress-ruptured or tensile tested. The very sigma prone composition had a shorter rupture life than the sigma-free or moderately sigma prone compositions when tested at 843 and 885 C. Elongation in room temperature tensile tests was considerably lower for the very sigma prone composition than for the other two wrought compositions after prolonged exposure at 732 or 843 C. Author

N74-23116*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

CRACK-GROWTH BEHAVIOR IN THICK WELDED PLATES OF INCONEL 718 AT ROOM AND CRYOGENIC TEMPERATURES

Royce G. Forman Washington May 1974 50 p refs

(NASA-TN-D-7665; JSC-S-391) Avail: NTIS HC $3.25 CSCL 11F

Results of mechanical-properties and axial-load fatigue and fracture tests performed on thick welded plates of Inconel 718 superalloy are presented. The test objectives were to determine the tensile strength properties and the crack-growth behavior in electron-beam, plasma-arc, and gas tungsten are welds for plates 1.90 cm (0.75 in) thick. Base-metal specimens were also tested to determine the flaw-growth behavior. The tests were performed in room-temperature-air and liquid nitrogen environments. The experimental crack-growth-rate data are correlated with theoretical crack-growth-rate predictions for semielliptical surface flaws. Author

N74-23117*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ASRDI OXYGEN TECHNOLOGY SURVEY, VOLUME 7: CHARACTERISTICS OF METALS THAT INFLUENCE SYSTEM SAFETY

James J. Pelouch, Jr. Washington 1974 74 p refs

(NASA-SP-3077) Avail: NTIS HC $3.75 CSCL 11F

A literature survey and analysis of the material and process factors affecting the safety of metals in oxygen systems is presented. In addition, the practices of those who specify, build, or use oxygen systems relative to the previous is summarized. Alloys based on iron, copper, nickel, and aluminum were investigated representing the bulk of metals found in oxygen systems. Safety-related characteristics of other miscellaneous metals are summarized. It was found that factors affecting the safety of metals in oxygen systems exit in all phases of the evolutionary process, from smelting and mill techniques through end-production fabrication. The safety of a given metal in an oxygen system was determined to be influenced by the particular service requirement. The metal characteristics should favorably influence fulfillment of these requirements. Thus, no singular metal or alloy could be classified as safest for all types of oxygen service. Author

N74-23118# Aeronautical Research Labs., Melbourne (Australia).

A STUDY OF THE VARIATION OF ORDER IN QUENCHED Cu3Au

G. R. Towers Dec. 1973 8 p refs

(ARL/Met-Note-95) Avail: NTIS HC $4.00

Anomalies were reported in physical properties of Cu3Au when samples quenched from 700 C are compared with samples quenched from 500 C. A similar anomaly was found in the observed Debye-Waller factors of quenched Cu3Au samples. This latter variation is analysed in terms of a phenomenological order parameter and explained by considering the role of vacancies during the quench. Author

N74-23119# National Research Council of Canada, Ottawa (Ontario).

COPPER EXCHANGE BETWEEN LIQUID IRON IN THE CARBON-SATURATED RANGE AND SODIUM SULPHIDE SLAGS

H. Schenck, H. Roth, and E. Steinmetz 1974 31 p refs Transl. into ENGLISH from Arch. Eisenhuettenw. (West Germany), v. 41, no. 7, 1970 p 595-603

(NRC-TT-1749) Avail: NTIS HC $4.75

Experiments to remove copper from pig iron by means of sodium sulphide using permanent, transitory, and counterflow processes are described. The distribution constant and the mass transfer coefficient were determined. Dependence of the transfer coefficient on temperature,conditions of agitation,and on the iron content of slag was noted. An electrochemical interpretation of the transfer of copper was given. Author

N74-23120# Kernforschungszentrum, Karlsruhe (West Germany).

INVESTIGATION OF THE COLLECTIVE MOVEMENTS IN POLYCRYSTALLINE AND LIQUID COPPER BY INELASTIC NEUTRON SCATTERING

S. Hagen Sep. 1973 66 p refs

(KFK-1774) Avail: AEC Depository Libraries HC $5.50

The scattering of slow neutrons by solids and liquids was investigated in a rotating crystal -time of flight- spectrometer to determine whether the dynamical behavior of copper in the liquid state is influenced by collective modes. The double differential scattering cross section was measured for polycrystalline copper and for liquid copper. A Q-dependency of the quasi-elastic scattering for liquid copper, which is known as the Gennes-narrowing, was observed, indicating the existence of collective atomic motions in the liquid state. To confirm the result, the scattering law of liquid copper in the inelastic region was compared with other models. Author

N74-23121# Texas Univ., Austin. Dept. of Physics.

BULK AND SURFACE PROPERTIES OF METALS Final Report

Leonard Kleinman Jan. 1974 12 p refs

(Contract AF-AFOSR-2308-72; AF Proj. 9761)

(AD-776018; AFOSR-74-0248TR) Avail: NTIS CSCL 20/12

The authors have calculated the energy bands of VO2 in both the metallic and semiconducting phases demonstrating that the metal-insulator transition can be understood in simple one-electron theory. It is demonstrated that if one takes the proper combination of the degenerate wave functions of the star of vector k, the orbital symmetry rules for chemisorption can always be satisfied. The gradient term of the Kohn-Sham exchange is derived plus correlation potential showing that Sham's result for exchange alone was incorrect. A hydrodynamic solution of the Boltzmann equation for surface plasmons was obtained. Using a new method the energy bands and charge density for a (100) lithium film has been calculated and a method for obtaining nearly self consistent potentials in metal films is developed. This potential was used for the calculation of surface states in the (100), (110) and (111) faces of aluminum. (Modified author abstract) GRA

N74-23122# Georgia Inst. of Tech., Atlanta. Physical Sciences Div.

EFFECTS OF INTERFACE PHENOMENA ON THE MECHANICAL BEHAVIOR OF METALS

Edgar A. Starke, Jr. and Billy R. Livesay Feb. 1974 21 p refs

(Grant AF-AFOSR-2064-71; AF Proj. 9761)

(AD-776009; AFOSR-74-0304TR) Avail: NTIS CSCL 11/6

This paper summarizes research on the relative importance of various interface parameters on the mechanical behavior of metals. A broad research program included the study of such parameters as differential modulus, crystal structure, degree of order, stacking fault energy, type of interface, etc., and their effect on yield strength, work-hardening, low-cycle fatigue, and friction and wear. The material summarized in this report describes how the objectives of the program were achieved. (Modified author abstract) GRA

N74-23123# Naval Research Lab., Washington, D.C.

J INTEGRAL AND THE INITIATION OF CRACK EXTENSION IN A TITANIUM ALLOY

G. R. Yoder and C. A. Griffis 26 Feb. 1974 37 p refs

(RR02201465431)

(AD-776212; NRL-7662) Avail: NTIS CSCL 11/6

The J integral has been examined as a criterion for the initiation of crack extension in specimens of an alloy for which crack extension occurs long before maximum load. The Ti-6Al-4V alloy selected is known to be susceptible to the sustained-load-cracking form of subcritical crack growth. Four types of three-point bend specimens were employed: of two different thicknesses (B = 0.5 and 1.0 in.) and two crack lengths (a = 0.685 and 0.885 in.). These fatigue-precracked specimens exhibited, to varying degrees, loading behavior characteristic of the lower end of the elastic-plastic regime. For each specimen type, values of the J integral were obtained as a function of crack extension. Values of the J integral were determined on the basis of a compliance-type calibration which used the plane-stress solutions of Bucci et al. These solutions were found to simulate well the loading curves of the fatigue-precracked specimens. Fore each specimen type, crack extensions were defined by unloading duplicate specimens from various points on the load-displacement diagram and heat tinting. GRA

N74-23124# Virginia Univ., Charlottesville. Research Labs. for the Engineering Sciences.
VOID INITIATION IN DUCTILE FRACTURE
Robert W. Bauer and Heinz G. F. Wilsdorf Mar. 1974 13 p refs
(Contract N00014-69-A-0060-0004; NR Proj. 036-084)
(AD-775881; MS-3533-107-74) Avail: NTIS CSCL 11/6

Fracture surfaces of 304 stainless steel were examined with a scanning electron microscope and inter void and inter particle spacings were measured. A significant relationship between inter void spacings and fracture stress was found. It was concluded that voids preceding ductile fracture could be initiated without the presence of secured phase particles in pure metals and clean alloys. Author (GRA)

N74-23238* Kanner (Leo) Associates, Redwood City, Calif.
INFLUENCE OF ACOUSTIC PARAMETERS ON THE MECHANICAL PROPERTIES OF LOW-ALLOY STEELS WELDED IN A VIBRATED FIELD
I. Sonea *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 71-76 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 101-106 (For availability see N74-23226 14-23)
CSCL 11F

N74-23240* Kanner (Leo) Associates, Redwood City, Calif.
THE EFFECT OF ULTRASONICS ON THE STRENGTH PROPERTIES OF CARBON STEEL PROCESSED BY COLD PLASTIC DEFORMATION
N. Atanasiu, O. Dragan, and Z. Atanasiu *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 84-88 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 117-122 (For availability see N74-23226 14-23)
CSCL 11F

N74-23258* Kanner (Leo) Associates, Redwood City, Calif.
STUDY OF STRUCTURE DEFECT INTERACTIONS IN ALUMINUM BY THE ACOUSTIC METHOD
I. I. Nicolaescu *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 194-198 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 249-254 (For availability see N74-23226 14-23)
CSCL 11F

N74-23262* Kanner (Leo) Associates, Redwood City, Calif.
THE INFLUENCE OF STEEL ROUGHNESS AND GRANULATION ON THE ACCURACY OF PART THICKNESS MEASUREMENT BY MEANS OF ULTRASOUNDS
S. Sontea and M. Baltanoiu *In its* The 4th Natl. Conf. on Acoustics, Vol. 2 B (NASA-TT-F-15663) Apr. 1974 p 215-219 ref Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 277-282 (For availability see N74-23226 14-23)
CSCL 11F

N74-23521 European Space Research Organization, Paris (France).
HOT FATIGUE RESISTANCE IN FLUCTUATING AXIAL TENSION OF PER 7 AND IN 100 SUPERALLOYS
Georges Vidal (ONERA, Paris) et al *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 156-163 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 123-126 (For availability see N74-23512 14-34)

N74-23522 European Space Research Organization, Paris (France).
RELATIONSHIP BETWEEN THE GRAIN SIZE AND FATIGUE-STRIATED FACET DIMENSIONS IN AN ALUMINUM ALLOY
Georges Vidal (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 164-170 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 127-129 (For availability see N74-23512 14-34)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-23125* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REINFORCED STRUCTURAL PLASTICS Patent
Hyman R. Lubowitz (TRW, Inc., Redondo Beach, Calif.), William P. Kendrick (TRW, Inc., Redondo Beach, Calif.), John F. Jones (TRW, Inc. Redondo Beach, Calif.), Richard S. Thorpe (TRW, Inc., Redondo Beach, Calif.), and Eugene A. Burns, inventors (to NASA) (TRW, Inc., Redondo Beach, Calif.) Issued 7 Mar. 1972 3 p Filed 10 Jul. 1967 Sponsored by NASA
(NASA-Case-LEW-10199-1; US-Patent-3,647,529; US-Patent-Appl-SN-651972; US-Patent-Class-117-161UN; US-Patent-Class-117-126GR; US-Patent-Class-117-132B; US-Patent-Class-260-78TF) Avail: US Patent Office CSCL 11D

Reinforced polyimide structures are described. Reinforcing materials are impregnated with a suspension of polyimide prepolymer and bonded together by heat and pressure to form a cured, hard-reinforced, polyimide structure.
Official Gazette of the U.S. Patent Office

N74-23126*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A COMPUTATIONAL PROCEDURE TO ANALYZE METAL MATRIX LAMINATES WITH NONLINEAR LAMINATION RESIDUAL STRAINS
C. C. Chamis and T. L. Sullivan 1974 18 p refs Presented at Composite Reliability Conf., Las Vegas, Nev., 15-16 Apr. 1974; sponsored by Am. Soc. for Testing and Mater.
(NASA-TM-X-71543; E-7950) Avail: NTIS HC $4.00 CSCL 11D

An approximate computational procedure is described for the analysis of angleplied laminates with residual nonlinear strains. The procedure consists of a combination of linear composite mechanics and incremental linear laminate theory. The procedure accounts for initial nonlinear strains, unloading, and in-situ matrix orthotropic nonlinear behavior. The results obtained in applying the procedure to boron/aluminum angleplied laminates show that this is a convenient means to accurately predict the initial tangent properties of angleplied laminates in which the matrix has been strained nonlinearly by the lamination residual stresses. The procedure predicted initial tangent properties results which were in good agreement with measured data obtained from boron/aluminum angleplied laminates. Author

N74-23127*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TECHNIQUE FOR DIRECT MEASUREMENT OF MAGNETIC ENTROPY OF SOLIDS: RESULTS FOR DYSPROSIUM TITANIUM OXIDE
Dennis J. Flood Washington May 1974 24 p refs
(NASA-TN-D-7675; E-7859) Avail: NTIS HC $3.00 CSCL

11D

A measurement technique was devised which permits direct observation of the magnetic entropy of solids as a function of applied magnetic field. Measurements were made of the magnetic entropy, in the temperature range 2 to 20 K, of polycrystalline samples of dysprosium titanium oxide (Dy2Ti2O7) to determine its suitability for use as the working substance of a magnetic refrigerator. Magnetization measurements were also made at 4.2 K and below to provide additional information on the nature of the compound. The measurements indicated that crystalline electric fields perturbed the ground state of the dysprosium ions, removed the 16-fold degeneracy predicted by Hund's rules, and left only a twofold degeneracy in its place. A positive, temperature independent contribution to the magnetization was observed in the saturation region, which indicated that the doublet ground-state wave function was perturbed by a nearby unpopulated upper energy level. Author

N74-23128*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LOW TEMPERATURE COEFFICIENT OF RESISTANCE AND HIGH GAGE FACTOR IN BERYLLIUM-DOPED SILICON
J. B. Robertson and M. A. Littlejohn (North Carolina State Univ.) Washington Jun. 1974 17 p refs
(NASA-TN-D-7517; L-9297) Avail: NTIS HC $3.00 CSCL 11D

The gage factor and resistivity of p-type silicon doped with beryllium was studied as a function of temperature, crystal orientation, and beryllium doping concentration. It was shown that the temperature coefficient of resistance can be varied and reduced to zero near room temperature by varying the beryllium doping level. Similarly, the magnitude of the piezoresistance gage factor for beryllium-doped silicon is slightly larger than for silicon doped with a shallow acceptor impurity such as boron, whereas the temperature coefficient of piezoresistance is about the same for material containing these two dopants. These results are discussed in terms of a model for the piezoresistance of compensated p-type silicon. Author

N74-23129*# TRW Equipment Labs., Cleveland, Ohio.
THE PARTITIONED STRAINRANGE FATIGUE BEHAVIOR OF COATED AND UNCOATED MAR-M-302 AT 1000 C (1832 F) IN ULTRAHIGH VACUUM Final Report, 15 Jun. - 15 Oct. 1973
K. D. Sheffler Jun. 1974 48 p refs
(Contract NAS3-17786)
(NASA-CR-134626; TRW-ER-7723) Avail: NTIS HC $5.50 CSCL 11C

Elevated temperature (1000 C (1832 F)) vacuum fatigue tests have been conducted on uncoated and aluminide (PWA 45) coated cobalt-base MAR-M-302 alloy with the four different types of thermalmechanical reversed inelastic strain cycles (wave shapes) defined by the method of strainrange partitioning. Results of these tests indicated two major conclusions. First, there was no significant influence of the aluminide coating on the thermal-mechanical fatigue life of the MAR-M-302 alloy. Second, variations in the type of thermal-mechanical fatigue cycle applied caused significant variations of fatigue life for both coated and uncoated material. The longest lives were achieved with sigma sub pp type cycling, while the sigma sub cc cycle caused a reduction of fatigue life of about 1/2 order of magnitude with respect to the sigma sub pp life. The sigma sub cp type cycle caused a life reduction of between 1-1/2 and 2 orders of magnitude relative to the sigma sub pp life, while the sigma sub pc type cycle provided a fatigue life which appeared to be comparable to that generated by the sigma sub cc cycle. Author

N74-23130# National Research Council of Canada, Ottawa (Ontario).
EFFECT OF POROUS MEDIUM ON PHASE TRANSITIONS IN RESERVOIR SYSTEMS
G. F. Trebin and V. A. Simakov 1973 10 p refs Transl. into ENGLISH from Neft. Khoz. (Moscow), v. 49, no. 2, 1971 p 32-35
(NRC-TT-1719) Avail: NTIS HC $4.00

The effect of a porous medium on the phase transitions of oil and systems simulating oil were investigated. Test results show that the porous medium has no effect on the liquid-gas phase transitions of oils and systems simulating oils under conditions of thermodynamic equilibrium. Under nonequilibrium conditions, the oversaturation of an actual system under investigation both in the presence of a porous medium and without it depends on the rate of pressure and temperature reduction. Data were recorded using ultrasonic and volumetric methods. E.H.W.

N74-23131# Posterijen, Telegrafie en Telefonie, The Hague (Netherlands). Dr. Neher Lab.
INFLAMMABILITY OF PLASTICS [BRANDBAARHEID VAN KUNSTSTOFFEN]
P. Klapwijk Jan. 1974 10 p refs In DUTCH
(ChL-304) Avail: NTIS HC $4.00

Test methods for determining flammability of plastics are discussed. The methods are subdivided into materials tests, and finished products tests, and center around initiation and flame propagation. Methods applied to telecommunication materials, such as wire and cable insulation, and printed circuit boards, as adopted by the Dutch PTT, are summarized. ESRO

N74-23132# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Dept.
FILM, ALUMINIZED MYLAR OR KAPTON
J. VanNisselroy 8 Aug. 1973 10 p
(FOK-RV-73-80) Avail: NTIS HC $4.00

A specification is presented which describes requirements and limits of acceptability of Kapton or Mylar film with vacuum deposited aluminum coatings on one or both sides. The objective of this specification is the procurement of a well-bonded, highly IR reflecting aluminum coating which is to be used for thermal insulating assemblies of spacecraft. ESRO

N74-23133# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Dept.
MATERIAL SPECIFICATION FLUTEC PP 9
J. Leupen 2 Apr. 1973 5 p
(FOK-RV-73-26) Avail: NTIS

The properties of the fluid Flutec PP9 are established for use as damping fluid in nutation dampers. Viscosity and surface tension form basic characteristics. The fluid is used in aluminum alloy nutation dampers, mixed with argon. Due to the sloshing of the fluid caused by nutation, nutational movements are damped out. ESRO

N74-23134# Battelle Columbus Labs., Ohio.
[METAL AND CERAMIC TECHNOLOGY RESEARCH] Annual Report, 1 Aug. 1972 - 31 Jul. 1973
H. Dana Moran and J. F. Lynch 1 Oct. 1973 65 p
(Contract DSA900-73-C-0922)
(AD-775509; AMMRC-CTR-74-5) Avail: NTIS CSCL 05/2

The DoD, in 1955 established the Titanium Metallurgical Laboratory at Battelle-Columbus, expanding the scope and changing the name to Defense Metals Information Center in 1958. The Defense Ceramic Information Center was assigned to Battelle in 1967. The two centers were combined in 1971 forming the Metals and Ceramics Information Center (MCIC). This is the second annual report on the MCIC program, covering activities for the period 1 August 1972 through 31 Jul 1973 -- essentially the FY73 period. This was the first full year of operations under the full service charge policy. The first nongovernment site terminal, providing direct access to the DDC Defense RDT and E system, was installed in MCIC's facilities. After extensive checkout and user training, the terminal went on-line in January 1973, and has proven of substantial benefit to the MCIC mission. (Modified author abstract) GRA

N74-23135# Air Force Weapons Lab., Kirtland AFB, N.Mex.
TREATABILITY OF AQUEOUS FILM-FORMING FOAMS USED FOR FIRE FIGHTING Final Report, Jun. 1972 - Aug. 1973
Ronald K. Kroop and Joseph E. Martin Feb. 1974 93 p refs
(AF Proj. 683M)
(AD-775366; AFWL-TR-73-279) Avail: NTIS CSCL 13/2

The biodegradability of aqueous film-forming foams (AFFF) used for fire fighting was evaluated in laboratory-scale activated sludge and trickling filter reactors at the Air Force Weapons Laboratory. Three AFFFs were evaluated: Light Water FC-200 from 3M Company Aerowater 3 percent from National Foam Company; and Aerowater 6 percent, also from National Foam Company. Concentrations not to exceed 100 mg/1 of AFFF influent to the biological treatment process could be satisfactorily treated without affecting the performance of the process and with apparent detoxification of the AFFF. Adsorption of AFFFs onto activated carbon is practical. (Modified author abstract) GRA

N74-23136# Westinghouse Research Labs., Pittsburgh, Pa.
ORIGIN AND USE OF FRACTURE MECHANICS Interim Technical Report
F. F. Lange 18 Feb. 1974 22 p refs
(Contract N00014-68-C-0323)
(AD-776191; Rept-74-9D4-KERAM-R1-TR-10) Avail: NTIS CSCL 11/2

The origin and general applicability of fracture mechanics is discussed with general reference to ceramic materials. Author (GRA)

N74-23137# Stanford Research Inst., Menlo Park, Calif.
DEEXCITATION OF METASTABLES AT PLASMA BOUNDARIES Final Technical Report, 1 Jun. 1972 - 1 Nov. 1973
Graham Black, Henry Wise, Samuel Schechter, and Robert Sharpless Dec. 1973 59 p refs
(Contract F33615-72-C-1613; AF Proj. 7073)
(AD-776077; ARL-73-0182) Avail: NTIS CSCL 07/4

Wall deexcitation of N2 (v=1) was studied on a variety of different surfaces, using 4880 A laser radiation, the authors used the intensity of the anti-Stokes Raman scattering at 4382 A to monitor the N2(v=1) concentrations. The two-dimensional diffusion equation with Poiseuille flow was solved to interpret the results. The lowest values of the deactivation coefficient were recorded for quartz and Pyrex after 24 hours of exposure to the microwave afterglow. The results allow some conclusions to be made concerning the mechanism of vibrational deexcitation on walls. (Modified author abstract) GRA

N74-23138# Massachusetts Inst. of Tech., Cambridge.
FRACTURE OF GRAPHITE FIBER REINFORCED COMPOSITES Technical Report, Apr. 1972 - Apr. 1973
John F. Mandell, Su Su Wang, and Frederick J. McGarry Jul. 1973 150 p refs
(Contract F33615-72-C-1686; AF Proj. 7340)
(AD-775729; AFML-TR-73-142) Avail: NTIS CSCL 11/4

The fracture of thin, prenotched graphite/epoxy laminates was studied analytically and experimentally. The analytical portion of the study concentrated on a three-dimensional finite element analysis of the crack problem in anisotropic laminates featuring a two-stage solution employing a hybrid model multilayered element. The case of a four ply (45 degree/-45 degree/-45 degree/-45 degree) laminate was analyzed, and results are presented for the distribution of in-plane stresses and interlaminar shear stresses about a sharp crack tip; the transverse normal stress is not considered in the analysis. (Modified author abstract) GRA

N74-23139# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
INTERACTIVE PROGRAM IN DESIGN AND ANALYSIS OF COMPOSITE MATERIALS Final Report, Dec. 1969 - Aug. 1973
Theodore H. H. Pian Jan. 1974 39 p refs
(Contract F33615-70-C-1131; AF Proj. 6169)
(AD-775730; ASRL-TR-163-1; AFML-TR-73-317) Avail: NTIS CSCL 11/4

The report describes the results of three research areas: (1) development of analysis tools for composite plate and shell structures (2) basic studies of interlaminar shear (3) synthesis and design of adhesively bonded step joints. The university-industry-Air Force interaction and the educational accomplishments under this program are described. Finally, to indicate a significant impact of the present program, a brief description is given of another research program which deals with the analysis of laminated plates and shells of composite materials and is an extension of a preliminary study under the present program. Author (GRA)

N74-23140# Naval Research Lab., Washington, D.C.
EFFECTS OF THE ANISOTROPIC ELASTIC MODULUS OF A BORON-FIBER-REINFORCED ALUMINUM-MATRIX COMPOSITE ON SPECIMENS CALIBRATED FOR CRACK-LENGTH DETERMINATION Final Report
A. M. Sullivan and J. Stoop 27 Feb. 1974 16 p refs
(WR02204001)
(AD-776213; NRL-7675) Avail: NTIS CSCL 11/4

In an investigation undertaken to assess the suitability of the fracture mechanics parameter K sub c for determining the fracture resistance of a boron-fiber-reinforced aluminum-matrix composite, calibration curves designed to measure crack length under load were prepared with specimens at various angles to the fiber axis of the sheet. The effect of the anisotropy of Young's modulus E is reflected in the curves obtained. Scatter in the data indicates that this is not a reliable method for determining crack length for this material, a boron-fiber/6061-aluminum composite. Author (GRA)

N74-23141# Battelle-Northwest, Richland, Wash.
LAMELLAR COMPOSITES FORMED BY SPUTTER DEPOSITION Semiannual Technical Report
R. A. Busch and J. W. Patten Dec. 1973 26 p refs
(Contract F44620-73-C-0071; AF Proj. 9782)
(AD-776023; AFOSR-74-0245TR) Avail: NTIS CSCL 11/4

The initial work on the two concepts of the formation of lamellar composites by sputter deposition is presented. Author (GRA)

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-23142 Suomalainen Tiedeakatemia, Helsinki (Finland).
BOUNDARY FORMULAE FOR REDUCED POWERS IN THE ADAMS SPECTRAL SEQUENCE
Jukka Maekinen (Helsinki Univ.) 1973 45 p refs
(ISBN-951-41-0149-9) Copyright. Avail: Issuing Activity

The reduced powers are examined, which are derived from the cup product of the E sub 2 term of the Adams spectral sequence of a space when the cohomology ring of the space admits a co-commutative Hopf-algebra. The Z sub 2 action on the half smash of spheres is discussed. The reduced powers are described along with Kahn's work, and the boundary formulae for the Adams spectral sequence of S(0) are derived. F.O.S.

N74-23143 Suomalainen Tiedeakatemia, Helsinki (Finland).
GENERALIZED RESOLVENTS FOR HERMITIC AND ISOMETRIC OPERATORS IN THE PONTRYAGIN SPACE [VERALLGEMEINERTE RESOLVENTEN HERMITESCHER UND ISOMETRISCHER OPERATOREN IM PONTRJAGINRAUM]
Heinz Langer and Pekka Sorjonen 1974 45 p refs In GERMAN
(ISBN-951-41-0168-5) Copyright. Avail: Issuing Activity

A numerical analysis of hermitic and isohermitic operators with like or unlike defects and the important characteristics of a resolvent matrix are described. Mathematical models are developed to define the mesomorph and holomorph and functions. Various theorems are proposed to show the relations and dependences of the Pontryagin principles. Transl. by P.N.F.

N74-23144 Suomalainen Tiedeakatemia, Helsinki (Finland).
KLEENE ALGEBRA FOR FORMAL EXPRESSIONS [KLEENE-ALGEBREN FORMALER AUSDRUECKE]
A. B. Cremers 1974 20 p refs In GERMAN
(ISBN-951-41-0154-5) Copyright. Avail: Issuing Activity

The formulation of concepts of algebraic expressions is discussed. The cases of regular, semi-linear, and context-free languages are analyzed. Examples are given of finite algebra with regular expressions. Mathematical models are developed to demonstrate the relations and dependences of the algebraic parameters. Transl. by P.N.F.

N74-23145 Suomalainen Tiedeakatemia, Helsinki (Finland).
ON AN EXTENDED CLASS OF BOUNDED UNIVALENT FUNCTIONS
Ronald Kortram (Nijmegen Univ.) 10 Dec. 1973 17 p refs
(ISBN-951-41-0174-X) Copyright. Avail: Issuing Activity

Mathematical models are developed to define the upper bounds of an algebraic function. The method used is the power inequalities of Schiffer and Tammi. The mathematical relationships are solved to show the effects of the inequalities and the specific application to factors of the equation. Five coefficients are involved in the analysis and methods for defining each coefficient are demonstrated. Author

N74-23146 Suomalainen Tiedeakatemia, Helsinki (Finland).
EXTENSIONS OF ISOMORPHISMS OF POLYDISCS
Timo Erkama 12 Nov. 1973 5 p refs
(ISBN-951-41-0155-3; Rept-568) Copyright. Avail: Issuing Activity

A proof is given for a theorem related to extensions of isomorphisms of n-dimensional unit polydiscs. A.L.

N74-23147 Suomalainen Tiedeakatemia, Helsinki (Finland).
ON ISOMORPHISMS BETWEEN COVERING GROUPS CONTAINING PARABOLIC ELEMENTS
Tuomas Sorvali 1974 6 p refs
(ISBN-951-41-0162-6) Copyright. Avail: Issuing Activity

Groups of Mobius transformations which act discontinuously and freely on the upper half planes are analyzed. Mathematical models are developed to show the isomorphisms between covering groups containing parabolic elements. The characterization for the dilatation of an isomorphism, which is based on the distortion of hyperbolic elements, is defined. P.N.F.

N74-23148 Suomalainen Tiedeakatemia, Helsinki (Finland).
MEROMORPHIC FUNCTIONS WITH A SINGLE PRINCIPAL CLUSTER SET
Frederick Bagemihl 1973 8 p refs Presented at Colloq. on Mathematical Analysis, Jyvaeskylae, Finland, 14 Aug. 1973
(ISBN-951-41-0163-4) Copyright. Avail: Issuing Activity

Mathematical models are developed to describe the meromorphic functions with a single principal cluster set. The problem of determining for which closed subsets there exists a nonconstant holomorphic function is solved. Mathematical models are discussed to explain the relationships of the subsets and functions. P.N.F.

N74-23149 Suomalainen Tiedeakatemia, Helsinki (Finland).
HERMITE INTERPOLATION BY GENERALIZED RATIONAL FUNCTIONS
Matti Maekelae (Helsinki Univ. of Technol.), Olavi Nevanlinna (Helsinki Univ. of Technol.), and Aarne H. Sipilae (Helsinki Univ. of Technol.) 1974 12 p refs
(ISBN-951-41-0151-0) Copyright. Avail: Issuing Activity

Applications of the Hermite-Birkoff interpolation procedure are analyzed. The H-B interpolation is developed for use in connection with the numerical solution of initial value problems in ordinary differential equations. The problem is formulated and converted into a nearly equivalent linear equation. Mathematical matrices are examined to show the properties of some linear spaces. Author

N74-23150 Suomalainen Tiedeakatemia, Helsinki (Finland).
ON SOME GENERALIZED HERMITE-BIRKHOFF INTERPOLATION PROBLEMS
Matti Maekelae (Helsinki Univ. of Technol.), Olavi Nevanlinna (Helsinki Univ. of Technol.), and Aarne H. Sipilae (Helsinki Univ. of Technol.) 1974 13 p refs
(ISBN-951-41-0150-2) Copyright. Avail: Issuing Activity

The problem of finding an algebraic polynomial of the lowest possible degree satisfying given conditions for the values of the polynomial and its scattered derivatives is discussed. The problem is defined as a Hermite-Birkhoff interpolation problem. Interpolation problems are analyzed using classes of functions depending on a specific number of free parameters and a specific number of conditions for the interpolative function to satisfy. The properties that are demanded of the classes of functions in order to make them suitable for interpolation purposes are investigated. Author

N74-23151 Suomalainen Tiedeakatemia, Helsinki (Finland).
CLASSIFICATION THEORY FOR HARDY CLASSES OF ANALYTIC FUNCTIONS
Dennis Hejhal 1973 30 p refs
(ISBN-951-41-0153-7; Rept-566) Copyright. Avail: Issuing Activity

Much of the classification scheme obtained by Heins is already true for plane domains. The scheme is shown in three stages. The first stage consists of proving the so-called fundamental lemma. In the second stage, a weak form of the H sub p classification was proved using a method which is based on a classical theorem of Nevanlinna-Frostman. Riesz kappa-potentials were used to obtain a somewhat more detailed classification. Some rather surprising properties of function-theoretic null-sets of type H sub p were also proved. Author

N74-23152 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
NONLINEAR FILTERING BY MARKOV PROCESSES [NICHTLINEARE FILTERUNG BEI MARKOFF-PROZESSEN]
G. VanKeuk Aug. 1973 31 p refs In GERMAN; ENGLISH summary
(Rept-203) Avail: Issuing Activity

A short derivation of the Bayesian approach to nonlinear filtering is given. Limits and problems of application are demonstrated. Simple examples are presented and discussed. The Kalman filter, which has many applications, can be derived easily this way. Author (ESRO)

N74-23153*# Houston Univ., Tex. Dept. of Mathematics.
ON DIFFERENTIATING THE PROBABILITY OF ERROR IN THE MULTIPOPULATION FEATURE SELECTION PROBLEM, 2
B. Charles Peters (Texas A and M Univ.) Mar. 1974 12 p refs
(Contract NAS9-12777)
(NASA-CR-134248; Rept-31) Avail: NTIS HC $4.00 CSCL 12A

A condition for the Gateaux differentiability of the probability of misclassification as a function of a feature selection matrix B, assuming a maximum likelihood classifier and normally distributed populations, is given. It is also shown that if the probability of error has a local minimum at B then it is differentiable at B. Author

N74-23154*# California Univ., Berkeley. Electronics Research Lab.
A NOTE ON PARALLEL AND PIPELINE COMPUTATION OF FAST UNITARY TRANSFORMS
Bernard J. Fino and V. Ralph Algazi 30 May 1974 8 p refs
(Grant NGR-05-003-538; NSF GK-37282)
(NASA-CR-138228) Avail: NTIS HC $4.00 CSCL 12A

The parallel and pipeline organization of fast unitary transform algorithms such as the Fast Fourier Transform are discussed. The efficiency is pointed out of a combined parallel-pipeline processor of a transform such as the Haar transform in which 2 to the n minus 1 power hardware butterflies generate a transform of order 2 to the n power every computation cycle. Author

N74-23155# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
CALCULATION OF THE IRREGULARITY FACTOR N0/N1 OF A STATIONARY GAUSSIAN PROCESS WITH SINGLE PEAK POWER SPECTRAL DENSITY [BERECHNUNG DES UNREGELMAESSIGKEITSFAKTORS N0/N1 FUER EINEN STATIONAEREN GAUSS-PROZESS MIT EINGIPFLIGEM SPEKTRUM DER LEISTUNGSDICHTE]
E. Haibach and H. G. Koebler 1 Oct. 1972 37 p refs In GERMAN
(TB-97(1972)) Avail: NTIS HC $5.00

The application of a stochastic stress-time history in fatigue investigations is discussed. The procedure is based on a Gaussian random process which is obtained from the combination of a suitable random signal generator with a band pass filter. The irregularity factor of such a process is calculated for different settings of the filter, in order to determine the possible different variations for one parameter of the process, that is known to

affect the fatigue behavior. The results obtained for ideal and approximately for real filter characteristics by varying the bandwidth and the attenuation are presented in diagrams.
Author

N74-23156*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A COMPARISON OF COMPUTATIONAL METHODS AND ALGORITHMS FOR THE COMPLEX GAMMA FUNCTION
Edward W. Ng 1 May 1974 27 p refs
(Contract NAS7-100)
(NASA-CR-138457; JPL-TM-33-686) Avail: NTIS HC $4.50 CSCL 12A

A survey and comparison of some computational methods and algorithms for gamma and log-gamma functions of complex arguments are presented. Methods and algorithms reported include Chebyshev approximations, Pade expansion and Stirling's asymptotic series. The comparison leads to the conclusion that Algorithm 421 published in the Communications of ACM by H. Kuki is the best program either for individual application or for the inclusion in subroutine libraries. Author

N74-23157# Wisconsin Univ., Madison.
NONLINEAR VOLTERRA AND DELAY EQUATIONS Final Report, 1 Sep. 1964 - 8 Sep. 1973
Jacob J. Levin and John A. Nohel 7 Feb. 1974 7 p refs
(Contract DA-31-124-ARO(D)-266)
(AD-775436; AROD-4936-25-M; Rept-19) Avail: NTIS CSCL 12/1

Nonlinear Volterra and delay equations arise naturally in various branches of science, for example heat transfer, superfluidity, viscoelasticity, biology, genetics, nuclear reactor dynamics, and control theory. The study of the qualitative behavior of solutions of such equations is of intrinsic mathematical interest. Research under this contract can be divided into the following six categories: Asymptotic Behavior of Solutions of Volterra equations; Reactor dynamics; Perturbation theory for Volterra equations; A boundedness problem for a nonlinear Volterra equation arising in nuclear reactor kinetics; A nonlinear Volterra equation occurring in heat transfer and other problems; Asymptotic behavior of the bounded solutions of various functional equations. GRA

N74-23158# George Washington Univ., Washington, D.C. Program in Logistics.
COMPARISONS OF SMALL-SAMPLE POWER FOR TESTS OF EXPONENTIALITY
Carl M. Harris 1 Feb. 1974 23 p refs
(Contract N00014-67-A-0214-0001; NR Proj. 347-020)
(AD-774887; SERIAL-T-286) Avail: NTIS CSCL 12/1

The paper is intended to provide some results to guide applied operations research analysts in the choice of a statistical test for determining whether a set of observations can be said to come from an exponential distribution. Power comparisons are made for a total of five tests against what are deemed to be the most popular alternatives for sample sizes of 10, 20, 30, and 40, and for a number of different possible parameter values. Author (GRA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-23159 State Univ. of New York, Albany.
A POSSIBLE EFFECT OF LIGHTNING INITIATION ON THUNDERCLOUD PRECIPITATION DEVELOPMENT Ph.D. Thesis
Christopher Thomas Phelps 1973 111 p
Avail: Univ. Microfilms Order No. 74-9274

The possible effect of corona processes associated with lightning initiation upon the development of precipitation in thunderclouds is explored. A mechanism for stepped leader initiation, based on an experimental investigation of the characteristics of electrical corona discharges developing in uniform electric fields, is advanced and discussed. This model described charge displacements, arising from the unique nature of positive corona streamer propagation, which rapidly intensify the ambient electric field over a small volume and lead ultimately to the production of a strongly conducting stepped leader channel. Experiments to determine the nature of the interactions between positive corona streamers and water droplets are described. The results of these studies indicate that stepped leader initiation, and probably dart leader generation, taking place in a region where the ambient electric field is at least 300,000 v/m, result in the generation of a branched positive streamer system throughout a volume having a characteristic dimension of at least 250 m. Dissert. Abstr.

N74-23160 Florida State Univ., Tallahassee.
NUMERICAL SIMULATION OF THE PLANETARY BOUNDARY LAYER OVER BARBADOS, W. I. Ph.D. Thesis
John Denis Lee 1973 111 p
Avail: Univ. Microfilms Order No. 74-8401

A two-dimensional, four-layer model is developed to simulate the low tropospheric flow over Barbados, W.I., under unsaturated quasi-nondivergent synoptic conditions. Observations indicate that under these conditions the subcloud flow over the island is characterized by daytime low-level divergence and minimum cloudiness associated with maximum surface heating, and nighttime low-level convergence with higher frequency of shower activity, especially over the western half of the island. Physical explanations are sought in the model for this unusual behavior of the flow over a small heated tropical island. The mathematical model consists of layer-averaged equations for the conservation of momentum, mass, moisture, and thermodynamic energy of a Boussinesq fluid in hydrostatic balance. Integrations are made on an f-plane with the effects of moisture on momentum included through the use of virtual potential temperature in the buoyancy expression of the pressure gradient term. Dissert. Abstr.

N74-23161# Texas Univ., Austin. Atmospheric Science Group.
A CENTRAL TEXAS SYNOPTIC CLIMATOLOGY AND ITS USE AS A PRECIPITATION FORECAST TOOL M.S. Thesis
Herschel T. Knowles May 1974 47 p refs
(Rept-39) Avail: NTIS HC $5.50

A synoptic climatology was derived for Central Texas centering on Austin. Characteristics of the 500 millibar wind were combined with a surface wind parameter to type the 1200Z weather pattern for 2327 days of study. The relative frequency of precipitation was computed for three consecutive twelve-hour periods following 1200Z for each weather type. Use of the derived precipitation frequencies as a first estimate of the probability of precipitation, given a predicted circulation pattern, was evaluated for its effectiveness as a forecast tool. Results indicated that for the first twelve-hour period, use of the synoptic climatology provided guidance inferior to that currently available to forecasters in the field. However, for the second and the third twelve-hour periods, the synoptic climatology provided guidance superior to that available to meteorologists over teletype and the weather facsimile network. Author

N74-23162*# Oklahoma Univ., Norman.
ACOUSTIC SOUNDING IN THE PLANETARY BOUNDARY LAYER
Edward H. Kelly Washington NASA May 1974 89 p refs
(Contract NAS8-28659)
(NASA-CR-2431) Avail: NTIS HC $4.00 CSCL 04B

Three case studies are presented involving data from an acoustic radar. The first two cases examine data collected during the passage of a mesoscale cold-air intrusion, probably thunderstorm outflow, and a synoptic-scale cold front. In these studies the radar data are compared to conventional meteorological data obtained from the WKY tower facility for the purpose of radar data interpretation. It is shown that the acoustic radar echoes reveal the boundary between warm and cold air and other areas of turbulent mixing, regions of strong vertical temperature gradients, and areas of weak or no wind shear. The third case study examines the relationship between the nocturnal radiation inversion and the low-level wind maximum or jet in the light of conclusions presented by Blackadar (1957). The low-level jet is seen forming well above the top of the inversion. Sudden rapid growth of the inversion occurs which brings the top of the inversion to a height equal that of the jet. Coincident with the rapid growth of the inversion is a sudden decrease in the intensity of the acoustic radar echoes in the inversion layer. It is suggested that the decrease in echo intensity reveals a decrease in turbulent mixing in the inversion layer as predicted by Blackadar. It is concluded that the acoustic radar can be a valuable tool for study in the lower atmosphere. Author

N74-23163# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 2, 1974
V. A. Bugayev, ed. 30 Apr. 1974 181 p refs Transl. into ENGLISH of Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 3-126
(JPRS-61869) Avail: NTIS HC $12.25

Articles are presented on micrometeorology, agricultural meteorology, weather forecasting, weather modification, and hydrology. For individual titles, see N74-23164 through N74-23182.

N74-23164 Joint Publications Research Service, Arlington, Va.
THE 40TH ANNIVERSARY OF GIDROMETEOIZDAT
A. N. Mikhaylov *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 1-8 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 3-8 (For availability see N74-23163 14-20)

A brief discussion on the development and current activities of Gidrometeoizdat is presented. Author

N74-23165 Joint Publications Research Service, Arlington, Va.
BASIC AND CONJUGATE EQUATIONS OF ATMOSPHERIC AND OCEANIC DYNAMICS c13
G. I. Marchuk *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 9-39 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 9-37 (For availability see N74-23163 14-20)

Conjugate equations of hydrodynamics are examined in application to the most important linear functionals of the problems of atmospheric dynamics. The properties of conjugate functions, described by conjugate equations, are presented and they are interpreted as functions of influence in relation to variations of hydrodynamic elements, depending on the input parameters of the problems. Author

N74-23166 Joint Publications Research Service, Arlington, Va.
COMPARISON OF VARIOUS WAYS OF USING METEOROLOGICAL INFORMATION IN ECONOMIC DECISION-MAKING
Ye. Ye. Zhukovskiy *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 40-52 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 38-48 (For availability see N74-23163 14-20)

Several characteristic ways of using meteorological information for economic decision making are analyzed and compared. It is shown that the rational utilization of climatological data and, in particular, of the laws of distribution of meteorological parameters that influence industry, greatly increases the effectiveness of decision in comparison with the use of standards as guidelines. An algorithm of optimum utilization of all climatological and forecasting information, providing maximum decision-making effectiveness, is proposed. Author

N74-23167 Joint Publications Research Service, Arlington, Va.
ON THE AEROCLIMATOLOGY OF EQUATORIAL WESTERLY WINDS OF THE LOWER TROPOSPHERE
Ye. K. Semenov *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 53-66 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 49-59 (For availability see N74-23163 14-20)

Detailed charts of the zonal component of the resultant wind over the tropics (from the Atlantic Coast of Africa eastward to the central Pacific Ocean) at the 850, 700, 500 and 200 mb isobaric levels for January, April, July and October, are constructed on the basis of the data gathered over the years at 272 stations and radio sounding data of 16 Soviet scientific sea expeditions. The main features of the zonal circulation in the tropics are examined and data are presented on the structure, vertical distribution and geographic location of the equatorial zone of westerly winds. The relationship between the westerly equatorial zone and the easterly flow of the upper troposphere is shown. Author

N74-23168 Joint Publications Research Service, Arlington, Va.
CENTERS OF ATMOSPHERIC ACTION AND THE STABILITY OF THE FIELD OF ANOMALIES OF MEAN MONTHLY AIR TEMPERATURES IN THE NORTHERN HEMISPHERE
V. F. Martazinova *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 67-76 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 60-67 (For availability see N74-23163 14-20)

A statistical method is described for predicting the stability of the field of anomalies for the mean monthly air temperatures of the Northern Hemisphere. Author

N74-23169 Joint Publications Research Service, Arlington, Va.
FREEZING OF RIVERS AND TYPES OF ICE JAMS c13
R. A. Nezhikhovskiy *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 77-85 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 68-74 (For availability see N74-23163 14-20)

The sequence of freezing of rivers in terms of the length and the location of ice jams are examined. Author

N74-23170 Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF AGROCLIMATIC CONDITION ACCORDING TO HARVEST ANOMALIES
F. N. Kogan *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 86-93 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 75-80 (For availability see N74-23163 14-20)

Deviations of cereal crop yields from the curve that characterizes the time-dependent fluctuation of agricultural productivity, are used as a criterion for evaluating agroclimatic conditions in various soil and climatic zones of the U.S.S.R. Author

N74-23171 Joint Publications Research Service, Arlington, Va.
SPECIAL POSTCARDS FOR GATHERING INFORMATION ABOUT SURFACE CURRENTS IN WATER BODIES c13
V. M. Bukin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 94-98 ref Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 82-85 (For availability see N74-23163 14-20)

A method of investigating surface currents, improved bottle mail and data processing methods are described. Author

N74-23172 Joint Publications Research Service, Arlington, Va.
ON THE TURBULENT STRUCTURE OF BOTTOM DENSITY CURRENTS c13
V. N. Anuchin, A. M. Gusev, and Yu. G. Pyrkin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 99-104 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 85-88 (For availability see N74-23163 14-20)

The results of theoretical investigation of bottom density currents are presented. The features of vertical distribution of turbulent current characteristics are examined. It is shown on the basis of a large volume of experimental data that bottom density currents have a dual character. When examined on a large scale they may be considered laminar, whereas on a small scale they are turbulent. Author

N74-23173 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF VARIOUS SPRING FERTILIZATION TIMES ON GROWTH AND DEVELOPMENT OF WINTER WHEAT WITH CONSIDERATION OF SOIL WATER RUNOFF c13
L. K. Konstantinov and V. S. Shkreba *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 105-109 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 88-90 (For availability see N74-23163 14-20)

The question of the times of spring fertilization of winter crops is examined with consideration of ground water runoff. It is established that excess water, as it flows down a slope washes nitrate away from the soil, which reduces the effectiveness of early fertilization with nitrogen fertilizers. In the case when the tilled layer accumulates 20-30 mm of moisture in excess of the field moisture capacity it is recommended that winter crops be fertilized in two periods: after the runoff of snow melt, and after completion of soil runoff, which increases the yield by up to 6-7 centners/hectare. Author

N74-23174 Joint Publications Research Service, Arlington, Va.
CLIMATE MODIFICATION TECHNIQUES
M. I. Budyko *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 110-122 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 91-97 (For availability see N74-23163 14-20)

A method of changing the influx of short wave radiation in the troposphere by influencing the aerosol layer of the lower stratosphere is examined. It is noted that the use of comparatively small quantities of reagents can appreciably reduce the summary radiation and reduce the surface air temperature, and also have an effect on the amount of precipitation that falls in intracontinental regions. Author

N74-23175 Joint Publications Research Service, Arlington, Va.
ANALYSIS OF THE TEMPERATURE PROFILE ACCORDING TO DATA OF RADIO SOUNDING OF THE ATMOSPHERE
A. F. Kuzenkov and V. N. Arbuzova *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 123-131 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 98-103 (For availability see N74-23163 14-20)

The temperature profile is analyzed on the basis of data from radio sounding of the atmosphere by combined examination of temperature pulsation spectra, sounding targets and sounding systems. The capabilities of various temperature sounding systems for analyzing atmospheric processes are discussed. It is shown that during sounding with the RKZ-3 sounding balloon in intervals greater than an average of 150 m, the spectral density of temperature pulsation exceeds the noise level by more than two times. During operations with the RKZ-2 sounding balloon the scales of temperature changes exceed 250 m with greater than 50% reliability. Inversions, characterized by 1 C temperature change, can be determined with a reliability of the order of 90% during sounding with the Meteorit-RKZ system. The noise of the measuring system of radio sounding, and consequently the measurement error can be reduced by a factor of 2.5-5 times in comparison with present values by means of optimum averaging. Author

N74-23176 Joint Publications Research Service, Arlington, Va.
ON THE POSSIBILITIES OF INVESTIGATING THE SPATIAL DISTRIBUTION OF ATMOSPHERIC OZONE WITH AN AIRBORNE OZONOMETER
V. V. Osechkin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 132-138 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 103-107 (For availability see N74-23163 14-20)

The theoretical principles for utilizating the ozonometer, installed in an airplane, for ozone sensing of the atmosphere, are examined. The advantages of using scheduled commercial airplanes for sensing atmospheric ozone are discussed. Some results of investigation of atmospheric ozone on air routes in the U.S.S.R. are presented. Author

N74-23177 Joint Publications Research Service, Arlington, Va.
EXPERIENCE OF THE MURMANSK UGMS IN SERVICING THE MERCHANT MARINES AND FISHING FLEET IN THE NORTH SEAS AND NORTH ATLANTIC c13
F. S. Terziyev *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 139-148 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 108-113 (For availability see N74-23163 14-20)

Experience in the organization of combined hydrometeorological servicing of the merchant marines and fishing fleet in the North Seas and North Atlantic Ocean by the Murmansk UGMS (Upravleniye Gidrometeorologicheskoy Sluzhby - Administration of Hydrometeorological Service) is discussed. Author

N74-23178 Joint Publications Research Service, Arlington, Va.
OCEANOLOGY, TERMS AND DEFINITIONS (GOST 18451-73, GOST 18458-73) c13
G. S. Ivanov *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 149-151 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 114-115 (For availability see N74-23163 14-20)

The publication of oceanology terms (GOST) is announced. The terms defined include terms for basic concepts, sea level, tidal phenomena, currents, waves, chemistry, and instruments. F.O.S.

N74-23179 Joint Publications Research Service, Arlington, Va.
SOIL MOISTURE c13
M. A. Kozin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 152-157 Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 115-116 (For availability see N74-23163 14-20)

A monograph is reviewed that generalizes the results of investigations of the network of agrometeorological and hydrometeorological stations, scientific subdivisions of Gidrometsluzhba and other agencies of the USSR, and foreign investigations. The most important problems of soil conditions, and their relationship to meteorological conditions, effect on agricultural productivity, crop growth, and agricultural harvest are analyzed. Author

N74-23180 Joint Publications Research Service, Arlington, Va.
AT THE MAIN ADMINISTRATION OF THE HYDROMETEOROLOGICAL SERVICE c34
V. Zakharov *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 158-159 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2 1974 p 118 (For availability see N74-23163 14-20)

The plan of scientific research and experimental design projects of the Hydrometeorological Service for 1974 is briefly reviewed. Author

N74-23181 Joint Publications Research Service, Arlington, Va.
SYMPOSIUM ON DIFFERENCE AND SPECTRAL METHODS OF SOLVING ATMOSPHERIC AND OCEANIC DYNAMICS PROBLEMS c13
S. A. Mashkovich *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 160-165 Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 118-121 (For availability see N74-23163 14-20)

The conference is reported on numerical forecasting and atmospheric modeling. An approach to the long range forecasting problem, and the accuracy of numerical integration of forecasting equations are discussed along with nonlinear computing instability, and false perturbations. F.O.S.

N74-23182 Joint Publications Research Service, Arlington, Va.
GLOBAL ATMOSPHERIC RESEARCH PROGRAM (GARP) c13
L. S. Gandin *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 166-171 Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2, 1974 p 121-124 (For availability see N74-23163 14-20)

Updated information on the first global experiment is presented. The special observer system for the equator, and the Southern Hemisphere are described, and the conference on numerical experimentation is briefly reported. F.O.S.

N74-23183*# Oklahoma Univ., Norman.
ACOUSTIC RADAR INVESTIGATIONS OF BOUNDARY LAYER PHENOMENA
Jacky R. Marks Washington NASA May 1974 65 p refs (Contract NAS8-28659)
(NASA-CR-2432) Avail: NTIS HC $3.75 CSCL 04B

A comparison is made between acoustic radar echoes and conventional meteorological data obtained from the WKY tower, for the purpose of better understanding the relationships between acoustic radar echoes and boundary layer processes. Two thunderstorm outflow cases are presented and compared to both acoustic radar data and Charba's gust front model. The acoustic radar echoes reveal the boundary between warm and cold air and other areas of mixing and strong thermal gradient quite well. The thunderstorm outflow of 27 June 1972 is found to compare with in most respects to Charba's gust front model. The major difference is the complete separation of the head from the main body of cold air, probably caused by erosion of the area behind the head by mixing with the ambient air. Two cases of nocturnal inversions caused by advection of warmer air aloft are presented. It is found that areas of turbulent mixing or strong thermal gradient can be identified quite easily in the acoustic radar record. Author

N74-23184*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE MINIMUM FREE-STREAM WIND SPEED FOR INITIATING MOTION OF SURFACE MATERIAL ON MARS
G. P. Wood, W. R. Weaver, and R. M. Henry May 1974 13 p refs
(NASA-TM-X-71959) Avail: NTIS HC $3.00 CSCL 04B

Estimates of the minimum free-stream wind speed that is required for initiating the motion of surficial material on Mars have ranged from 30 to about 200 meters per second. Thus the best value for this quantity is not well established. Graphical comparison of much of the pertinent data taken in the laboratory and in the field on Earth provides a minimum value for the Bagnold coefficient of 0.08 and this in turn provides a minimum value for the threshold friction velocity of 1.3 meters per second for initiating motion of particulate matter on Mars at low elevations where the pressure is 7 millibars. The most appropriate value of the ratio of friction velocity to free-stream velocity for putative unstable condition appears to be 0.026. Thus the minimum free-stream wind speed for initiating motion is obtained as 50 meters per second. If the surface material on Mars, however, is less cohesive than that on earth, the minimum value may be smaller. Author

N74-23185# Royal Netherlands Meteorological Inst., De Bilt.
RAINFALL OBSERVATIONS DURING 1972
Jun. 1973 131 p In ENGLISH and DUTCH
(KNMI-117) Avail: NTIS HC $9.75; Roy. Neth. Meteorol. Inst. F. 10

Rainfall observations during 1972 in the Netherlands are presented in tabular form. Monthly tables contain the daily amounts of precipitation together with the amounts per decade and per month at all stations of the Royal Netherlands Meteorological Institute. The tables also contain information regarding the normal values of precipitation during the period 1931 to 1960. Annual amounts of precipitation are presented in separate tables. ESRO

N74-23186# Royal Netherlands Meteorological Inst., De Bilt.
YEARBOOK A, NUMBER 124: METEOROLOGY
Jul. 1973 77 p In ENGLISH and DUTCH
(KNMI-97-124) Avail: NTIS HC $7.00; Roy. Neth. Meteorol. Inst. F 17,50

Results of meteorological observations made at 46 Dutch meteorological stations are presented in tabular form. The daily, monthly, and annual observations include: air pressure, wind direction, wind velocity, temperature, relative humidity, and vapor pressure. ESRO

N74-23187# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
ESTIMATED GLAZE ICE AND WIND LOADS AT THE EARTH'S SURFACE FOR THE CONTIGUOUS UNITED STATES Air Force Surveys in Geophysics.
Paul Tattelman 16 Oct. 1973 35 p refs
(AF Proj. 8624)
(AD-775068; AFCRL-TR-73-0646; AFCRL-AFSIG-277) Avail: NTIS CSCL 04/2

A climatology of glaze storms occuring in the U.S. from 1919-20 through 1968-69 was compiled. A subjective analysis of these storms was used to develop probability estimates of ice accretion for seven regions in the U.S. east of the Rocky Mountains. Estimates of combined ice and wind loads are also present. The greatest probability of severe ice storms exists from the central and northern plains through the upper midwest eastward to New England. The single point probability of at least one occurrence of an ice storm + or > 2.5 cm in one year in the northeastern U.S. is 0.0002. The single point probability of an ice storm = or > 5.0 in this same area is 0.00018. For the southeastern U.S. the probability of such occurrences in one year are 0.0004 and near zero, respectively. Author (GRA)

N74-23188# National Climatic Center, Asheville, N.C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS, WESTERN EUROPEAN COASTAL MARINE AREAS. VOLUME 4, AREA 18 - SHETLAND ISLANDS NW, AREA 19 - ORKNEY ISLANDS, AREA 20 - EDINBURGH, AREA 21 - GRIMSBY, AREA 22 - RHINE DELTA, AREA 23 - BREMERHAVEN
Jan. 1974 487 p Sponsored by Naval Weather Service Command, Washington, D. C.
(AD-775435) Avail: NTIS CSCL 04/2

The data contained in these tables were obtained from Tape Data Family 11 (TDF-11) Marine Surface Observations. TDF-11 was primarily funded by the Naval Weather Service Command and selected by NWSED Asheville as the most comprehensive collection of marine surface observations from which to develop a series of Coastal Marine Summaries. The areas include: Shetland Islands, Orkney Islands, Edinburgh, Grimsby, Rhine Delta and Bremerhaven. GRA

N74-23189# Stanford Research Inst., Menlo Park, Calif.
LIDAR STUDIES OF STACK PLUMES IN RURAL AND URBAN ENVIRONMENTS Final Report
Warren B. Johnson, Jr., Robert J. Allen, and William E. Evans Oct. 1973 112 p refs
(Contract CPA-70-49)
(PB-227347/2; EPA-650/4-73-002) Avail: NTIS HC $4.50 CSCL 14B

Experimental results are presented from field studies of smoke plume diffusion and pollution-layer structure in both rural and urban areas, using the Mark 8 mobile lidar (laser radar) system. This system was first applied to study the behavior of smoke plumes from the 250-m stacks of a large coal-burning power plant. Examples from the study of characteristic changes in plume diffusion and low-level aerosol structure resulting from time-varying meteorological conditions are presented in the form of vertical plume cross sections. Helicopter measured SO2 cross sections and the lidar-obtained smoke cross sections are compared on a case-study basis. The mobile lidar observations in urban areas reveal significant variabilities in the pollution-layer structure associated with urban effects, transitional meteorological conditions, and apparent convective influences. GRA

N74-23190# Bureau of Mines, Bartlesville, Okla.
OXYGENATES IN AUTOMOTIVE EXHAUSTS. EFFECT OF AN OXIDATION CATALYST
D. E. Seizinger and B. Dimitriades Dec. 1973 26 p refs
(PB-2270971/3; BM-RI-7837) Avail: NTIS HC $3.25 CSCL 13B

Analytical methods for oxygenates in exhaust gases were studied, and emission of these compounds from automotive engines were measured. It was shown that an estimate of the oxygenate yield from gasoline used in a noncatalytic system can be synthesized from data obtained with simple fuels. Such synthesized data were used for comparison of noncatalytic with catalytic systems. It is concluded that the compositional character and class distribution of oxygenates in exhaust from catalytic systems may differ significantly from the composition and distribution for oxygenates not subjected to catalytic conversion. (Modified author abstract) GRA

N74-23191# Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.
THE NATIONAL AIR MONITORING PROGRAM: AIR QUALITY AND EMISSIONS TRENDS, VOLUME 2 Annual Report
Aug. 1973 357 p
(PB-227272/2; EPA-450/1-73-0013) Avail: NTIS HC $21.00 CSCL 13B

Based on data from the National Air Sampling Networks, air quality trends are presented for: total suspended particulates for 1960 through 1971; carbon monoxide, oxides of nitrogen, and oxidants for 1962 through 1971; and sulfur dioxide for 1964 through 1971. Included is a detailed evaluation of ambient air quality for three Air Quality Control Regions. For the period 1940 through 1970, emissions trends are presented on a national basis only. Air quality data, emissions data, and summaries of monitoring activities are presented for each State and Air Quality Control Region. Specific program areas emphasized are data acquisition and analysis, and trend identification and interpretation. (Modified author abstract) GRA

N74-23192# Battelle Columbus Labs., Ohio.
CHEMICAL AND PHYSICAL CHARACTERIZATION OF AUTOMOTIVE EXHAUST PARTICULATE MATTER IN THE ATMOSPHERE (YEAR ENDING 30 JUNE 1972) Final Report
C. W. Melton, R. I. Mitchell, D. A. Trayser, and J. F. Foster Jun. 1973 91 p refs Prepared for Coordinating Res. Council, Inc.
(Contract EPA-68-02-0205)
(PB-227413/2; EPA-650/2-73-001) Avail: NTIS HC $7.75 CSCL 13B

The objective of this project is to determine the physical and chemical characteristics of particulate matter from internal combustion engines as a function of sampling procedure, engine operating conditions including emission control systems, fuel composition, and residence time in the atmosphere. Emphasis is to be placed on the study of particulate matter during its lifetime in the atmosphere. Author (GRA)

N74-23193# Naval Postgraduate School, Monterey, Calif.
A THEORETICAL STUDY OF METEOROLOGICAL EFFECTS ON THE DISPERSION OF ATMOSPHERIC CONTAMINANTS IN THE COAST ENVIRONMENT M.S. Thesis
Michael Alan McCallister Mar. 1974 64 p refs
(AD-776281) Avail: NTIS CSCL 04/2

Present numerical models describing pollutant diffusion employ two main approaches to the problem: gaussian bivariate distributions and numerical simulations of diffusion. The thesis examines numerical models of each method. The governing equations are discussed, with basic assumptions which permit reasonable simplifications to be made. Results of both models are examined qualitatively to describe patterns of marine-layer pollutant dispersal. Calculations from both models reveal wind velocity to be the most critical atmospheric characteristic controlling dispersion. Rates of spreading are also closely related to other measurable meteorological properties such as thermal stability and mixing depth. (Modified author abstract) GRA

N74-23194# Stanford Research Inst., Menlo Park, Calif.
NUMERICAL PROCEDURES FOR ANALYZING AND PREDICTING MESOSCALE TROPICAL WEATHER PATTERNS Final Report, 26 Feb. 1971 - 31 Dec. 1973
Robert L. Mancuso and Daniel E. Wolf Jan. 1974 60 p refs
(Contract DAHC04-71-C-0013)
(AD-775848; AROD-9432-9-EN) Avail: NTIS CSCL 04/2

A multi-layer numerical model was developed for forecasting sybsynoptic weather over tropical regions. The model is based principally on winds, vorticity, and divergence that are potentially observable from geosynchronous satellites. It has been developed for use on a mini-computer system and is designed to facilitate testing of different formulations. Experiments were carried out to test various advection techniques since it is particularly important that mesoscale features be preserved in the forecast. In these experiments, the different techniques were compared with regard to their accuracy and computational efficiency. A quasi-Lagrangian scheme was found to give significantly better results than the more conventional methods, such as the leap frog. Investigations were carried out in regard to using cloud motions as wind input to the numerical forecasting model. A method for determining winds from satellite data in clear areas was proposed: tracking of humidity patterns on isentropic surfaces. (Modified author abstract) GRA

N74-23195# Rome Air Development Center, Griffiss AFB, N.Y.
A PROPOSED FORM FOR THE ATMOSPHERIC MICROTEMPERATURE SPATIAL SPECTRUM IN THE INPUT RANGE
Darryl P. Greenwood and Donald O. Tarazano Feb. 1974 102 p refs
(ARPA Order 1279; AF Proj. 317J)
(AD-776294; RADC-TR-74-19) Avail: NTIS CSCL 04/2

Measurements of the atmospheric microtemperature statistics demonstrate poor agreement with the traditional von Karman model for large scale sizes. Data were taken during four missions at two sites which have a minimum of terrain inhomogeneities. At Kirtland AFB the sensors were at 20m and 33m above ground which has sparse low vegetation. At Griffiss AFB the sensors are 2m above grassy terrain and there are clumps of trees far upwind. The conditions were nearly ideal: high turbulence strengths and good mixing at mid-day. A model spatial spectrum is proposed with parameters to set the two power law dependencies and the transition rate betwen them. Temporal spectral data compare favorably with the proposed model and the residual error is attributed to the inappropriateness of the frozen flow hypothesis. The model is recommended for laser propagation calculations which depend on large scale sizes. (Modified author abstract) GRA

N74-23196# Environmental Prediction Research Facility (Navy), Monterey, Calif.
AN EVALUATION OF HONG KONG HARBOR AS A TYPHOON HAVEN
Donald A. Mautner and Samson Brand Dec. 1973 129 p refs
(AD-776232; ENVPREDRSCHF-Tech-Paper-9) Avail: NTIS CSCL 04/2

The study evaluates the harbor of Hong Kong as a typhoon haven. Characteristics of the harbor under tropical cyclone conditions, including topographical effects on the wind, storm surge, and reliability of moorings and anchorages are discussed and highlighted by two case studies (Typhoon ROSE, August 1971 and Typhoon WANDA, September 1962). Problem areas to be considered if remaining in port and possible evasion procedures for ships sailing from the port are examined for tropical cyclones approaching from various direct directions. Tropical cyclone tracks for 87 years of data (1884-1970) for the western North Pacific Ocean are examined in order to determine the probability of threat to the port of Hong Kong. Results suggest early sortie action under threatening conditions by all Fleet units capable of evasion at sea. An operationally oriented flow diagram summarizing the locations of the various sections of the text that could be used in decision making is also presented. Author (GRA)

N74-23197# Environmental Prediction Research Facility (Navy), Monterey, Calif.
POTENTIAL CUMULUS RAINFALL MODIFICATION PANAMA CANAL ZONE
Paul Lowe Dec. 1973 22 p refs
(AD-775616; ENVPREDSCHF-TP-10-73) Avail: NTIS CSCL 04/2

The results of computer simulation of both natural and modified cumulus clouds appropriate to the Panama Canal Zone were analyzed to derive tables of the probability of increasing or decreasing rainfall, the expected amounts of rainfall increase or decrease, and indices of potential yield arising from cumulus cloud modification. These tables are presented and discussed. Author (GRA)

N74-23198# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
STOCHASTIC MODELLING OF THE AREAL EXTENT OF WEATHER CONDITIONS Interim Report
Irving I. Gringorten 30 Nov. 1973 50 p refs
(AF Proj. 8624)
(AD-775986; AFCRL-TR-73-0731; AFCRL-ERP-459) Avail: NTIS CSCL 04/2

If the probability of a 24-hour rainfall, exceeding 1/2 inch, is 10 percent over a small area like a barn, how much greater is the probability of such an amount falling somewhere within a 1000-sq mile region. The generalization of this problem is to relate the probability of a meteorological event at a single location to the problem of its occurrence within a specified area or along a specific line of travel. A Monte Carlo technique was applied to a variable that is normally distributed everywhere in a horizontal space. The procedure produced synoptic maps in which the correlation between the elements at two stations decreases determinably with increasing distance between the stations. On each synoptic map the minimum in various-sized areas or along line segments of various lengths was found. From a large number (like 10,000) of such synoptic fields it was possible to plot estimates of the probability distributions of areal minima (or maxima) or minima (or maxima) along lines of travel. This kind of modelling was tested and found effective on temperatures along flight-path segments of several hundred to several thousand miles in length at 100 mb and on New England 24-hour rainfall. Author (GRA)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-23199*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
VEHICLE MISALIGNMENT PREDICTION AND VEHICLE/EXPERIMENT POINTING COMPATIBILITY ASSESSMENT
J. D. Hoverkamp Jan. 1974 71 p refs
(NASA-TM-X-64840) Avail: NTIS HC $6.75 CSCL 17G

A technique for predicting vehicle misalignment, the relationship of vehicle misalignment to the total vehicle/experiment integration effort, and the methodology used in performing a vehicle/experiment pointing compatibility assessment, are presented. The technique is demonstrated in detail by describing how it was used on the Skylab Program. Author

N74-23200# Joint Publications Research Service, Arlington, Va.
NAVIGATION AND INERTIAL DEVICES
9 May 1974 78 p refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 9, 10, 11, and 12, 1973
(JPRS-61943) Avail: NTIS HC $7.00

Dynamic stabilization and control of various inertial navigation devices are discussed. For individual titles, see N74-23201 through N74-23211.

N74-23201 Joint Publications Research Service, Arlington, Va.
ON THE DYNAMICS OF A GYROSTABILIZER WITH A RELAY CONTROL
A. M. Lestev *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 1-9 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 9, 1973 p 67-72 (For availability see N74-23200 14-21)

The motion of a gyrostabilizer with relay control is considered when dry friction forces are present in the bearings of precession and stabilization axes. The B. V. Bulgakov method and the averaging method are used. The stationary motions of the gyrostabilizer and the transfer processes in their vicinity are determined. Author

N74-23202 Joint Publications Research Service, Arlington, Va.
STUDY OF THE AUTO-OSCILLATIONS OF A DOUBLY INTEGRATING VIBRATION ACCELEROMETER
N. A. Pykhov *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 10-16 ref Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 9, 1973 p 81-85 (For availability see N74-23200 14-21)

Auto-oscillations are studied for a doubly integrating vibration accelerometer which contains a considerable nonlinearity. The basic factor which reduces the accuracy of doubly integrating accelerometers is friction in the pendulum supports. In the considered device friction is reduced considerably by oscillations of the pendulum support axis which represents a stator of an asynchronous miniature motor with a load located eccentrically with respect to the rotation axis of the stator. For an ideal relay characteristic of the power supply circuit of the control winding, the motor rotor will oscillate symmetrically. The stator will also oscillate due to reaction. Author

N74-23203 Joint Publications Research Service, Arlington, Va.
ON THE ERROR OF A STATICALLY UNBALANCED THREE-DEGREE-OF-FREEDOM GYROSCOPE
B. V. Vorozhbitov *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 17-21 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 9, 1973 p 72-76 (For availability see N74-23200 14-21)

An approximate analytical method is considered for calculating the error in a statically unbalanced three-degree-of-freedom gyroscope due to the influence of vibrating base. Author

N74-23204 Joint Publications Research Service, Arlington, Va.
ON PROBLEMS OF THE ERRORS OF THE ANALOGS OF AN INERTIAL SYSTEM OF COORDINATES
S. A. Filaretova *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 22-27 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 9, 1973 p 76-78 (For availability see N74-23200 14-21)

Equations of errors in the determination of coordinates of the current location of an object in inertial navigation systems are considered. These equations are refined by taking into account terms of the second order in errors of simulating an inertial coordinate system by means of an analytical analog in the computer device of the system. Author

N74-23205 Joint Publications Research Service, Arlington, Va.
ON THE MOTION OF A SINGLE-AXIS GYROSTABILIZER WITH RELAY CONTROL, WITH DRY FRICTION IN THE BEARING SUPPORTS TAKEN INTO ACCOUNT
N. Ya. Kogan and L. V. Kogan *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 28-35 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 10, 1973 p 66-70 (For availability see N74-23200 14-21)

Spatial phase and point conversion methods are used to investigate the dynamics of a single axis gyrostabilizer; relay control with dry friction in the bearing supports is taken into account. The viscous friction in the bearing supports is not taken into account. It is shown that with relay control, dry friction in the bearing support of the stabilizer does not provide stable modes of operation for the gyrostabilizer. Author

N74-23206 Joint Publications Research Service, Arlington, Va.
ON THE QUESTION OF THE ACCURACY OF ORIENTATION OF AN OBJECT THAT HAS BEGUN MOVING FROM AN INCLINED STARTING POINT
L. N. Danilovich *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 36-42 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 10, 1973 p 70-73 (For availability see N74-23200 14-21)

Formulae derivations are given for the determination of the orientation of an object in the azimuth by means of a three degree gyroscope with a horizontal axis. The general case when the longitudinal axis of the object forms a small angle with the longitudinal axis of the base is considered, and it is shown that a relationship exists between the orientation error in azimuth due to the starting conditions of the gyroscope and the angular coordinates of the object in the process of motion. G.G.

N74-23207 Joint Publications Research Service, Arlington, Va.
THE DYNAMICS OF THE START-UP OF A PYROTECHNICAL GYROMOTOR WITH A TURBINE ROTOR
V. Ya. Raspopov *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 43-51 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 11, 1973 p 75-79 (For availability see N74-23200 14-21)

A gyromotor set is considered that includes a rotor on the perimeter of which are located holes and a power pressure accumulator. The dynamics of starting the turbine type rotor by a jet of hot gas are analyzed. G.G.

N74-23208 Joint Publications Research Service, Arlington, Va.
ON ONE METHOD OF DAMPING THE OSCILLATIONS OF A GYROCOMPASS BASED ON A THREE-AXIS GYROSTABILIZER
I. A. Mikhalev and V. V. Ryabtseva *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 52-55 ref Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 11, 1973 p 80-82 (For availability see N74-23200 14-21)

One possible method for damping the oscillations of a gyrocompass based on a three-axis gyrostabilizer is considered. Results of the experimental investigation are cited. Author

N74-23209 Joint Publications Research Service, Arlington, Va.
ON THE ELASTIC-DAMPING YIELDING OF THE STRUCTURES OF GYROSCOPIC DEVICES
G. M. Proskuryakov *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 56-63 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 12, 1973 p 53-57 (For availability see N74-23200 14-21)

An experimental method for determining the elastic damping/yielding of device structures is reported and certain results are cited on the experimental investigation of structural rigidity and structural damping of typical parts of gyrotachometers. Author

N74-23210 Joint Publications Research Service, Arlington, Va.
INFLUENCE OF THE ROLLING AND PITCHING OF A SHIP ON THE MEASUREMENT OF ITS SPEED BY MEANS OF LOGS
V. I. Yushchenko *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 64-68 ref Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 12, 1973 p 58-61 (For availability see N74-23200 14-21)

Coordinates systems, tied to the center of gravity of a ship and to the surface of water stationary with respect to earth, are used to analyze the influence of rolling and pitching on errors, in ship speed measurements by means of logs. It is shown that relative logs will measure speeds of motion with an error that has periodic as well as static components leading to a shift in the average values of their indications. If the static errors are relatively small, the periodic components can attain four or five percent of the entire actual speed of the ship. Author

N74-23211 Joint Publications Research Service, Arlington, Va.
ON THE QUESTION OF COMPENSATING THE SYSTEMATIC ERROR OF A GRAVIMETER c14
A. P. Filimonov *In its* Navigation and Inertial Devices (JPRS-61943) 9 May 1974 p 69-74 refs Transl. into ENGLISH from Priborostroyeniye (Leningrad), no. 12, 1973 p 61-64 (For availability see N74-23200 14-21)

Compensating the systematic error of a gravimeter by means of an efficient change in parameters in the correction circuit of the stabilizing device is considered. Author

N74-23212# Joint Publications Research Service, Arlington, Va.
SPACECRAFT NAVIGATION ON INTERPLANETARY TRAJECTORIES
M. Borisov 24 May 1974 10 p Transl. into ENGLISH from Krasnaya Zvezda (Moscow), no. 2, 4 Apr. 1974 p 4
(JPRS-62084) Avail: NTIS HC $4.00

The design and development of the components of a Mars space probe are discussed. The background for the mission planning and trajectory analysis are provided. The energy computations which determined the launching dates, the duration of the flight, the kinematic characteristics of approach of the station to Mars, and the parameters of the segment near the planet are analyzed. Author

N74-23213*# Linguistic Systems, Inc., Cambridge, Mass.
A LANGUAGE FOR CALCULATING THE ORIENTATION OF A SPACECRAFT
P. K. Kazakova and A. K. Platonov Washington NASA May 1974 16 p Transl. into ENGLISH of "Yazyk dlya Rascheta Oriyentatsiyi Kosmicheskogo Apparata", paper presented at the 24th Intern. Astronaut. Congr., Baku, USSR, 7-13 Oct. 1973 (Contract NASw-2482)
(NASA-TT-F-15547) Avail: NTIS HC $4.00 CSCL 22C

The method presented is based on the development of a mathematical language of elementary concepts describing a spacecraft's orientation parameters. The language is used for constructing the orientation of the Venera Automatic Interplanetary Space Station and is compared with more cumbersome methods. Author

N74-23214# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
ANGEL CLUTTER AND THE ASR AIR TRAFFIC CONTROL RADAR. VOLUME 1: STUDY RESULTS Final Report, Oct. 1971 - Feb. 1973
J. R. Barry, B. K. Carter, R. J. Erdahl, R. L. Harris, J. T. Miller, G. D. Smith, and R. M. Barnes Feb. 1973 206 p refs 2 Vol.
(Contract DOT-FA72WA-2705)
(AD-775258; APL-MSO-F-195-Vol-1; FAA-RD-73-158-1) Avail: NTIS CSCL 17/7

The goal of this study was to identify angel clutter reduction techniques which were cost-effective for the existing ASR-4, 5, and 6 radars. This report identifies a combination of techniques which can be implemented without major radar re-design and which improves the ASR surveillance capability. These techniques were developed through analysis of ASR video and track radar data gathered during the Spring 1972 bird migrations at Milwaukee's General Mitchell Airport. The proposed angel clutter reduction (ACR) features operate on the three major differences observed between angel and aircraft signal characteristics: signal strength, pulse-to-pulse amplitude fluctuations, and velocity. These ACR features were chosen because they provide the highest level of effectiveness consistent with timely implementation and a reasonable degree of radar modification. (Modified author abstract) GRA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-23215 Wisconsin Univ., Madison.
VACUUM ULTRAVIOLET FLUORESCENCE OF ELECTRON EXCITED SUPERFLUID HELIUM Ph.D. Thesis
Marilyn Stockton 1973 99 p
Avail: Univ. Microfilms Order No. 73-28354

The vacuum ultraviolet fluorescence of electron excited superfluid helium was studied under both continuous low power excitation and pulsed gigawatt excitation. In the first case the superfluid helium was bombarded continuously with from 1 to 60 microangstrom of 160 keV electrons. The electrons enter the liquid bypassing through a thin metal foil, and the VUV light is dispersed by a spectrograph. In the case of the pulsed gigawatt excitation the superfluid helium is excited by a 10 nsec pulse of from 7 to 20 KA of 300 keV electrons. Three methods were used to introduce the electrons into the liquid: (1) a Bennett diode where electrons are emitted from a glass rod and accelerated through a thin metal foil into the liquid helium; (2) a metal cathode which replaces the glass rod; and (3) a liquid helium arc created by placing the cathode and ground plane directly into the superfluid helium. Dissert. Abstr.

N74-23216 Oklahoma State Univ., Stillwater.
AN OBJECTIVE STUDY OF THE EVAPOROGRAPHIC METHOD OF INFRARED IMAGING Ph.D. Thesis
John Willard Hines 1973 81 p
Avail: Univ. Microfilms Order No. 74-8037

The evaporographic method of infrared imaging is evaluated in order to see if a sensitivity of .1 degree centigrade could be obtained. This goal was reached under the restrictions of a 40 second exposure time, the use of an f:1.4 lens system, and the use of a fluid with 3 centistoke viscosity. Primary limitation on the sensitivity of the device was the latent heat of evaporation of the oil, and the minimum detectable thickness change of the oil film on the membrane. Dissert. Abstr.

N74-23217 Wisconsin Univ., Madison.
A NUMERICAL EVALUATION OF THE HELMHOLTZ INTEGRAL IN ACOUSTIC SCATTERING Ph.D. Thesis
Gerald Allyn Sandness 1973 121 p
Avail: Univ. Microfilms Order No. 73-28345

A numerical technique is described which utilizes measured values of the acoustic pressure of the incident beam, including the side lobes, thereby removing the uncertainty which normally results from approximating the form of the incident beam. A comparison of numerical, analytical, and experimental results is made for the case of a vertically incident beam and a moderately rough surface. The numerical computations are shown to yield values of the scattered pressure which agree well with experimental data for both rough and smooth surfaces. Dissert. Abstr.

N74-23218 Notre Dame Univ., Ind.
MICROWAVE ADSORPTION IN GADOLINIUM-YTTRIUM ALLOYS Ph.D. Thesis
Monzoor Ahmed Mojumder 1974 148 p
Avail: Univ. Microfilms Order No. 74-8896

The magnetoelastic excitation spectra as a function of an external field have been derived for the cases of the helicoidal and fan structures by including the magnetoelastic terms. The numerical values of the excitation frequencies are obtained by calculating the eigenvalues of two 14 x 14 matrices using the

Q-R Algorithm. Experimental investigation of the microwave absorption spectra of two gadolinium-yttrium alloys has been done from liquid helium to room temperatures, using microwave radiation of frequency ranging from 9 to 37 GHz, and magnetic field varying from 0 to 19 KOe. Gadolinium yttrium alloys are convenient analogs of the heavy rare-earth and results of experimental investigation agree reasonably well with the calculations. Dissert. Abstr.

N74-23219 Cornell Univ., New York.
MODELS OF COMPACT X-RAY SOURCES Ph.D. Thesis
Jonathan Isaac Katz 1973 204 p
Avail: Univ. Microfilms Order No. 74-6382

The problems are discussed of building detailed models to explain the complex observations of compact X-ray sources. A vibrating white dwarf was proposed as the origin of the regular pulsations with periods of 4.84 seconds in Cen X-3 and 1.24 seconds in Her X-1. This proposal is studied with a numerical hydrodynamic calculation of the atmosphere of a vibrating white dwarf. It is found that this model falls several orders of magnitude short of the observed X-ray powers, and also has the wrong X-ray spectrum and pulse shape. These results, which disagree with those of previous calculations, are due to an acoustic mismatch between vibrations of the white dwarf interior and those of its atmosphere, and to efficient cooling of shock heated atmospheric matter by Compton recoil on the soft photospheric photon flux in luminous white dwarfs. Dissert. Abstr.

N74-23220 Syracuse Univ., N.Y.
ON THE CRITERION FOR FERROMAGNETISM Ph.D. Thesis
Paul Te Fu Chang 1973 138 p
Avail: Univ. Microfilms Order No. 74-8239

A criterion for ferromagnetism is developed for a model constituted by a single electronic energy band. The Hamiltonian (consisting of one-electron energies plus Coulomb repulsion) is written in Wannier representation and then truncated by dropping those terms corresponding to overlap integrals of more than two centers. The stability of the state in which each site has exactly one electron, and where all spins are parallel is then considered. The energy of this stationary state is then compared to the energy of the stationary states with one-reversed spin. The latter states are linear combinations of single-site spin-reversed states and polar states. The expansion coefficients are shown to satisfy two coupled difference equations. These equations are expressed in terms of the relative and center-of-mass coordinates of the polar sites. The two coupled difference equations are further reduced to a set of N homogeneous equations. Dissert. Abstr.

N74-23221 British Broadcasting Corp., Kingswood (England). Research Dept.
DIGITAL SOUND: FEASIBILITY OF CHANGING FREQUENCY PRE-EMPHASIS BY A DIGITAL FILTER
T. A. Moore Apr. 1974 10 p refs
(BBC-RD-1974/19) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The feasibility of using a digital filter to change the pre-emphasis applied to an audio signal encoded in digital form from the CCIR (50 microseconds) characteristic to the CCITT characteristic is investigated. This filter is required at the interface between bit-streams carrying 13-bit and companded 10-bit digital sound signals. The disadvantage of using an analogue method for this purpose is that a separate filter would be needed for each audio channel in the multiplexed signal preceeded by a digital-to-analogue converter and followed by an analogue-to-digital converter. It is shown that satisfactory results would be obtained by using a relatively simple (second-order) digital filter, and with filter coefficients specified to 8-bit accuracy. Some hardware aspects are considered, and it is concluded that, by using suitable time sharing techniques and appropriate data storage, one central (multiplier) unit could serve a group of six multiplexed audio channels. Author

N74-23222+ Lignes Telegraphiques et Telephoniques, Conflans-Sainte-Honorine (France). Lab. d'Etudes Microelectronique.
STUDY AND IMPLEMENTATION OF MATRIX OF TRANSDUCERS FOR SURFACE WAVES Final Report [ETUDE ET REALISATION D'UNE MATRICE DE TRANSDUCTEURS EN ONDES DE SURFACE COMPTE RENDU DE FIN DE CONTRAT]
J. M. Lagorsse, M. Seguin, and B. Serzec Nov. 1971 25 p refs In FRENCH
(Contract DGRST-71-7-2971)
Avail: NTIS HC $4.25

Various parasitic couplings between surface wave ultrasonic piezoelectric transducers disposed in matrix form on a common substrate were investigated. A theoretical and experimental analysis of the acoustic, capacitive, and radiative coupling was performed. The acoustic diffraction profiles were calculated and compared to a user optical heterodyne profile measurement. The e.m. interactions between emitter and receiver were studied as a function of the transducer material quality. A double coding and filtering comb-like transducer was implemented in matrix form on a common substrate. Special e.m. shielding techniques for materials with high permittivity are discussed. Three types of lines were prepared: simple, Barker, and complementary Golay lines. Out of band parasitic waves, especially volumic waves, can be rejected at more than 80 db. ESRO

N74-23223+ Institut Superieur d'Electronique du Nord, Lille (France). Lab. d'Ultrasons.
RAYLEIGH WAVE PRODUCTION IN METALS. APPLICATION TO MATERIALS FATIGUE Final Report [PRODUCTION DES ONDES DE RAYLEIGH SUR DES METAUX. APPLICATION A L'ETUDE DE LA FATIGUE DES METERIAUX COMPTE RENDU DE FIN DE CONTRAT]
J. Pouliquen, G. Leman, and A. Defebvre Dec. 1972 19 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-2793)
Avail: NTIS HC $4.00

A liquid film coupling method allows acoustic path up to 90 mm in steel. Solid film coupling (Stoneley waves) depends heavily on film nature, and insertion losses are high. The best method appears to be the intermediate plate method using conversion into Lamb waves. Difficulties associated with instabilities, amplitude modulation, and frequency shifts are detailed. A feedback method was devised to measure variation in phase velocity (one part per million) and attenuation (0.005 db) to detect metal defects. The dynamics of the processes are discussed, and applications to the study of rupturing, static flexion, creep, and corrosion are presented. ESRO

N74-23224+ Compagnie Generale d'Electricite, Marcoussis (France). Dept. Energie.
LOW EMISSIVITY COEFFICIENT AND HIGH ELECTRIC RESISTANCE LAYERS FOR ALTERNATOR CRYOSTAT Final Report [ETUDE DES COUCHES A FAIBLE COEFFICIENT D'EMISSIVITE ET FORTE RESISTANCE ELECTRIQUE POUR CRYOSTAT D'ALTERNATEUR]
Jun. 1973 25 p refs In FRENCH
(Contract DGRST-72-7-0162)
Avail: NTIS HC $4.25

Various possible materials of low emissivity, high reflectance in I.R., and high resistance are presented for use in cryoalternators with a view to reducing Foucault current losses. A theoretical study shows the potential merits of: strips of pure metals, Al microcrystals separated by alumina, oxides, and fluorides in superposed layers. A test rig was set up for absorptivity measurements at low temperatures and a resistivity measuring instrument was built. Samples of materials were prepared and details are given. Preliminary results of measurements are discussed. Author ESRO

N74-23225*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-FIELD MAGNETIZATION OF Dy2O3
Dennis J. Flood Apr. 1974 5 p refs
(NASA-TM-X-71535; E-7778) Avail: NTIS HC $4.00 CSCL 20C

The magnetization of powdered samples of Dy_2O_3 has been measured at temperatures between 1.45 deg and 4.2 K, in applied magnetic fields ranging to 7 Teslas. A linear dependence of magnetization on applied field is observable in high field region, the slope of which is independent of temperature over the range investigated. The extrapolated saturation magnetic moment is 2.77 + or - 0.08 Bohr magnetons per ion. Author

N74-23226*# Kanner (Leo) Associates, Redwood City, Calif.
THE FOURTH NATIONAL CONFERENCE ON ACOUSTICS. VOLUME 2, B. ULTRASONICS
Washington NASA Apr. 1974 258 p refs Transl. into ENGLISH of A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 330 p
(Contract NASw-2481)
(NASA-TT-F-15663) Avail: NTIS HC $16.00 CSCL 20A

The present book encompasses many theoretical and practical aspects of the science of ultrasounds. Some articles describe new ultrasonic generators and recorders. Others deal with applications of ultrasonic methods in laboratory research and industrial applications. It is shown that ultrasonic methods can be advantageously applied to a host of problems, such as boiler decrusting, electrolyte polishing, metalworking and woodworking, nondestructive testing of materials, cold drawing of tubes, and mineral flotation. The velocity and other characteristics of ultrasounds are investigated in different media, such as chemical solutions and different kinds of wood. For individual titles, see N74-23227 through N74-23267.

N74-23227* Kanner (Leo) Associates, Redwood City, Calif.
ON THE ULTRASONIC HOLOGRAPHY c14
Jerzy K. Zieniuk *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 1-6 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 13-19 (For availability see N74-23226 14-23)
CSCL 20A

The development of a system of ultrasonic holography is discussed. The limitations of the acousto-optical transformers, the scanning method, and the Pohlman cell are analyzed. The application of the free liquid surface deformation method is emphasized. The test equipment required for the liquid surface deformation method is described. An illustration of a typical test installation is provided. Author

N74-23228* Kanner (Leo) Associates, Redwood City, Calif.
METHOD OF VIBRATION ANALYSIS USING HOLOGRAPHIC INTERFEROMETRY AND HETERODYNE OPTICAL DETECTION c14
V. I. Vlad, J. Maurer, and D. Popa *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 7-14 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 21-27 (For availability see N74-23226 14-23)
CSCL 14E

A method of studying thin plate vibrations with the aid of a laser beam is discussed. Through a suitable combination of time-average holographic interferometry, real-time holographic interferometry, and heterodyne optical detection, it is possible to obtain complete information on the vibration parameters of modes, amplitudes, frequencies, and phases. The method has the advantage of three dimensional global observation, noncontact, and high precision measurements. Author

N74-23229* Kanner (Leo) Associates, Redwood City, Calif.
INTERFEROMETRIC METHODS FOR MEASUREMENT OF ULTRASONIC WAVE VELOCITY: CLASSIFICATION, CHARACTERISTICS AND BASIC DEFECTS
Zdzislaw Kozlowski *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 15-20 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 29-34 (For availability see N74-23226 14-23)
CSCL 20A

Interferometric methods may be considered to include all methods in which the time necessary for a signal to pass through a medium is determined on the basis of the period of oscillation of which the signal consists, while the distance is determined by noting the coincidence between (1) interference between the measured signal and its reflection and ultrasonic interference, or between another signal serving as a reference and electrical interference in the electronic part of the device. In general, all interferometric methods are relatively simple and permit a high degree of accuracy. Theoretically 48 different variations may be distinguished, about 30 of which are capable of practical application. For liquids, where transverse waves do not exist, the number of possible variations is limited to 40, assuming that absolute velocity measurement is desired. Author

N74-23230* Kanner (Leo) Associates, Redwood City, Calif.
CORRELATION OF THE RATE OF ULTRASOUND PROPAGATION WITH OTHER CHARACTERISTIC MAGNITUDES OF THE LIQUID STATE
C. Stetiu *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B. (NASA-TT-F-15663) Apr. 1974 p 21-26 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 37-42 (For availability see N74-23226 14-23)
CSCL 20A

The application of ultrasonic radiation to the procedure for determining the physical properties of liquids is discussed. The basis for linking the kinetic properties of liquids to the equilibrium properties through the molecular structure and the potential of the intermolecular forces is defined. The test procedure using ultrasonic radiation is described. Results of tests with specified fluids are tabulated. Author

N74-23231* Kanner (Leo) Associates, Redwood City, Calif.
PORTABLE APPARATUS WITH CRT DISPLAY FOR NONDESTRUCTIVE TESTING OF CONCRETE BY THE ULTRASONIC PULSE METHOD c14
G. Manta, Y. Gurau, P. Nica, and I. Facacaru *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 27-32 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 45-50 (For availability see N74-23226 14-23)
CSCL 14B

The development of methods for the nondestructive study of concrete structures is discussed. The nondestructive test procedure is based on the method of ultrasonic pulse transmission through the material. The measurements indicate that the elastic properties of concrete or other heterogeneous materials are a function of the rate of ultrasonic propagation. Diagrams of the test equipment are provided. Mathematical models are included to support the theoretical aspects. Author

N74-23232* Kanner (Leo) Associates, Redwood City, Calif.
ELECTRONIC POWER GENERATORS FOR ULTRASONIC FREQUENCIES c14
D. Ciovica *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 33-39 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 53-60 (For availability see N74-23226 14-23)
CSCL 14B

The design and construction of an ultrasonic frequency electronic power generator are discussed. The principle design elements of the generator are illustrated. The generator provides an inductive load with an output power of two kilowatts and a variable output frequency in the fifteen to thirty KiloHertz range. The method of conducting the tests and the results obtained with selected materials are analyzed. Author

N74-23233* Kanner (Leo) Associates, Redwood City, Calif.
LABORATORY ULTRASONIC GENERATOR c14
C. Tudose and F. Dobrescu *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 40-52 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 63-78 (For availability see N74-23226 14-23)
CSCL 14B

The characteristics of an ultrasonic generator with magnetostrictive amplifiers are described. The generator was designed to supply an output power of about 400 watts at a consumption of about 1 kilowatt. The generator produces sound waves in the frequency range of 18 to 30 KHz. The circuit design is described and examples of the construction are illustrated. The generator is used to study different industrial processes such as the effect of ultrasonic radiation of the emulsification of liquids, the dispersion of solids, and ultrasonic filtration. Author

N74-23234* Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTIONS TO THE STUDY OF INDUCTIVE TRANSDUCERS FOR MEASURING THE AMPLITUDE OF VIBRATIONS IN SOLID MEDIA
O. Dragan, N. Galan, A. Sirbu, and C. Ghita *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B. (NASA-TT-F-15663) Apr. 1974 p 45-52 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 71-78 (For availability see N74-23226 14-23)

The design and construction of inductive transducers for measuring the vibrations in metal bars at ultrasonic frequencies are discussed. Illustrations of the inductive transducers are provided. The quantitative relations that are useful in designing the transducers are analyzed. Mathematical models are developed to substantiate the theoretical considerations. Results obtained with laboratory equipment in testing specified metal samples are included. Author

N74-23235* Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTIONS TO THE STUDY OF ULTRASONIC MACHINING c15
G. Savii and T. Iclanzan *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 53-59 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica, Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 81-87 (For availability see N74-23226 14-23)
CSCL 13H

Problems in the industrial application of ultrasounds are discussed. Starting from the industrial characteristics of ultrasonic working, especially of hard and fragile materials that are difficult to work by means of conventional methods, the characteristics of the feed system, the circulation system of the abrasive suspension, and the ultra-acoustic unit of machines for ultrasonic working are described. Experiments on the behavior of different types of ultra-acoustic unit design and on the optimal operating conditions connected with the manner of execution, fixation, and excitation conditions are analyzed. Author

N74-23236* Kanner (Leo) Associates, Redwood City, Calif.
METALWORKING WITH ULTRASONIC ENERGY c15
I. Sonea and M. Minca *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 60-66 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 89-95 (For availability see N74-23226 14-23)
CSCL 13H

The application of ultrasonic radiation for metal working of steel is discussed. It is stated that the productivity of the ultrasonic working is affected by the hardness of the material to be worked, the oscillation amplitude, the abrasive temperature, and the grain size. The factors that contribute to an increase in the dislocation speed are analyzed. Experimental data are provided to substantiate the theoretical parameters. Author

N74-23237* Kanner (Leo) Associates, Redwood City, Calif.
DEVICE FOR RECORDING THE 20 Hz - 200 KHz SOUND FREQUENCY SPECTRUM USING TELETRANSMISSION c14
I. Baciu *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 67-70 ref Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 97-100 (For availability see N74-23226 14-23)
CSCL 14B

The device described consists of two distinct parts: (1) The sound pickup system consisting of the wide-frequency band condenser microphone which contains in the same assembly the frequency-modulated oscillator and the output stage. Being transistorized and small, this system can be easily moved, so that sounds can be picked up even in places that are difficult to reach with larger devices. (2) The receiving and recording part is separate and can be at a great distance from the sound pickup system. This part contains a 72 MHz input stage, a frequency changer that gives an intermediate frequency of 30 MHz and a multichannel analyzer coupled to an oscilloscope and a recorder. Author

N74-23238* Kanner (Leo) Associates, Redwood City, Calif.
INFLUENCE OF ACOUSTIC PARAMETERS ON THE MECHANICAL PROPERTIES OF LOW-ALLOY STEELS WELDED IN A VIBRATED FIELD c17
I. Sonea *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 71-76 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 101-106 (For availability see N74-23226 14-23)
CSCL 11F

The advantages and disadvantages of slag welding are given. A suitable method is proposed for introducing ultrasonic oscillations in the process of depositing the metal in the slag bath. Some practical results are given of experimental studies of the mechanical and structural characteristics obtained with the welding of steels under vibrated and nonvibrated conditions, respectively. Certain physical phenomena that attend the moving metal particle in slag welding are analyzed. Author

N74-23239* Kanner (Leo) Associates, Redwood City, Calif.
POWDER PRESSING IN A MACROSONIC FIELD c15
A. Protipopescu, O. Dragan, and D. Ciovica *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 77-83 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 109-115 (For availability see N74-23226 14-23)
CSCL 13H

An investigation was conducted to extend the technology of powder product manufacturing to new forms and sizes, to improve their quality as well as pressing efficiency and to reduce waste. In the course of metal and nonmetal powder briquette pressing, macrosounds were associated with the external static pressing force, which led to an increase in the relative height, density and physicomechanical characteristics of the briquettes. This method permits the extension of the range of products that can be manufactured from powders and the improvement of their quality. Author

N74-23240* Kanner (Leo) Associates, Redwood City, Calif.
THE EFFECT OF ULTRASONICS ON THE STRENGTH PROPERTIES OF CARBON STEEL PROCESSED BY COLD PLASTIC DEFORMATION c17
N. Atanasiu, O. Dragan, and Z. Atanasiu *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 84-88 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 117-122 (For availability see N74-23226 14-23)
CSCL 11F

A study was made of the influence of ultrasounds on the mechanical properties of OLT 35 carbon steel tubes cold-drawn on a plug ultrasonically activated by longitudinal waves. Experimental results indicate that: 1. The reduction in the values of the flow limit and tensile strength is proportional to the increase in acoustic energy introduced into the material subjected to deformation. 2. The diminution in influence of ultrasounds on tensile strength and flow rate that is due to an increased degree of deformation is explained by a reduction in specific density of the acoustic energy at the focus of deformation. 3. The relations calculated on the basis of the variation in the flow limit and tensile strength as a function of acoustic energy intensity was verified experimentally. Author

N74-23241* Kanner (Leo) Associates, Redwood City, Calif.
SOME RESEARCH CONCERNING THE COLD DRAWING OF TUBES ON AN ULTRASONICALLY ACTIVATED PLUG c15
O. Dragan, D. Ciovica, and S. Novac *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 89-96 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 125-131 (For availability see N74-23226 14-23)
CSCL 13H

The results are discussed of studies of the influence of macrosounds on a metal's friction and deformation conditions at the focus of deformation, on the mechanical characteristics of cold-drawn tubes, and on the dynamic stability of the focus of deformation. In the course of these studies, experimental equipment was developed and perfected. Under the proposed conditions the cold drawing of tubes on an ultrasonically activated plug turned out to be viable and efficient. Author

N74-23242* Kanner (Leo) Associates, Redwood City, Calif.
THE ACTION OF MACROSOUNDS ON GRAPHITE ORE AND DERIVED PRODUCTS
C. Bradeteanu and O. Dragan *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 97-101 Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 133-138 (For availability see N74-23226 14-23)
CSCL 20A

A suspension of graphite ore, floated graphite, and the gangue left over from flotation were subjected to the action of macrosounds under determinant conditions. The following was found: (1) The graphite ore undergoes an efficient settling action. (2) The floated graphite is strongly crushed down to the dimensions of colloidal graphite. (3) The gangue left over from flotation can be further processed to recuperate graphite from its nuclei. Author

N74-23243* Kanner (Leo) Associates, Redwood City, Calif.
ON THE DYNAMIC STABILITY OF THE FOCUS OF DEFORMATION IN THE COLD DRAWING OF TUBES ON AN ULTRASONICALLY ACTIVATED PLUG c15
O. Dragan, G. Simonescu, S. Novac, and N. Matei *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-15663) Apr. 1974 p 102-111 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 139-148 (For availability see N74-23226 14-23)
CSCL 13H

In the case of macrosonic drawing, it was experimentally determined that tube eccentricity is less than in the case of tube drawing without macrosonics. On this basis, a theoretical analysis was carried out of the effect of macrosounds on tube eccentricity, an analysis that qualitatively confirms the experimental data. Author

N74-23244* Kanner (Leo) Associates, Redwood City, Calif.
SOME ASPECTS OF USING ULTRASOUNDS TO IMPROVE SULFUROUS MINERAL FLOTATION TECHNOLOGY c15
V. P. Mihu and I. Pop *In its* The 4th Natl. Conf. on Acoustics Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 112-117 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 151-156 (For availability see N74-23226 14-23)
CSCL 13H

The results are discussed which were obtained with a new method of desorption of collector reagents connected with improving the selectivity of the flotation of copper and lead concentrate through the action of ultrasounds. Analysis of the results obtained by treating copper and lead concentrate in an ultraacoustic field indicates an increase in the copper content of the copper concentrate, of the lead content in the lead concentrate and, at the same time, a reduction in the lead of the copper concentrate. Author

N74-23245* Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTIONS TO STUDY OF THE STABILITY OF THE ELECTRIC WELDING ARC UNDER THE ACTION OF ACOUSTIC PRESSURE c15
S. Petru *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 118-125 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 159-164 (For availability see N74-23226 14-23)
CSCL 13H

During the treatment of an electric welding arc with ultrasonic oscillations, an improvement was found in overall source-arc stability. Theoretical explanations are provided for this phenomenon and formulas of equivalence between the classical arc and the treated arc are derived, taking stability as their criterion. A knowledge of this phenomenon can be useful in extending the applications of ultrasounds to different forms of electric arcs. Author

N74-23246* Kanner (Leo) Associates, Redwood City, Calif.
CONTRIBUTIONS TO THE USE OF MACROSOUNDS FOR BOILER DECRUSTING c15
C. Bradeteanu *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 126-130 ref Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 167-170 (For availability see N74-23226 14-23)
CSCL 13H

The results of an investigation indicate the following: (1) The deposition of incrustations on the heating surfaces of steam boilers can be prevented by inserting between heating surface and water an insulating layer on which the boiler incrustation will be deposited. (2) The insulating layer reduces the coefficient of heat transmission by 2%. (3) The insulating layer can be removed by macrosounds with a frequency of about 20 kHz, after any interval of boiler operation. Author

N74-23247* Kanner (Leo) Associates, Redwood City, Calif.
ON PARTICLE MOTION IN AN ELECTRIC WELDING ARC TREATED WITH SONIC OR ULTRASONIC OSCILLATIONS c15
S. Petru *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 131-138 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 173-178 (For availability see N74-23226 14-23)
CSCL 13/4

The criteria for the stability of the subharmonic, harmonic, or superharmonic oscillations determine the relation between acoustic field parameters and particle parameters. The derived formulas underlie the destruction of the fragile Widmanstatten structure in weldings and therefore the designing of the generators that must be used for this welding process. Author

N74-23248* Kanner (Leo) Associates, Redwood City, Calif.
CRACKING AND REFORMATION OF SATURATED HYDROCARBONS BY ULTRASOUND IN THE PRESENCE OF WATER c15
M. R. O. Prudhomme and J. Lefort *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 139-147 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 181-185 (For availability see N74-23226 14-23)
CSCL 13H

The exposure of saturated hydrocarbons to ultrasound (800 kHz, 6 W/sq cm) in the presence of water results in: (1) cleavage of the carbon chain, producing saturated and unsaturated hydrocarbons with a lower number of carbons than the initial hydrocarbon (cracking); and (2) recombination after cleavage, producing saturated and unsaturated hydrocarbons with a higher number of carbons than the initial hydrocarbon (reformation). The addition of argon facilitates these phenomena. The effects are attributed to a homolytic (radical) mechanism occurring within the cavitation bubbles under the effects of microsparks. Author

N74-23249* Kanner (Leo) Associates, Redwood City, Calif.
EFFECTS OF ULTRASONIC FIELDS IN THE PHOSPHORIC ACID PROCESS c06
E. Kowalska, J. Mizera, and H. Jakobiec *In its* The 4th Natl. Conf. on acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 148-152 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 187-191 (For availability see N74-23226 14-23)
CSCL 07D

A process of apatite decomposition with sulfuric acid was studied under the influence of ultrasound in the phosphoric acid production process. The studies were carried out with and without ultrasonic fields in the reaction mixture, which resembled the mixing ratio used in technical production processes. Ultrasound with a frequency of 20 kHz and an intensity of 1 W/sq cm was used in the studies. A very favorable ultrasonic effect upon the degree of apatite decomposition was observed. The ultrasonic field affects the shape of byproduct gypsum crystals. In the H_3PO_4 production process without ultrasound, the byproduct gypsum crystallizes as long, thin needles which cause problems in filtration. In the trials involving the application of wound, gypsum crystallized in the form of small platelets possessing a favorable ratio of length to width. Author

N74-23250* Kanner (Leo) Associates, Redwood City, Calif.
ULTRASONIC FILTRATION OF INDUSTRIAL CHEMICAL SOLUTIONS c06
T. Cosma *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-156631) Apr. 1974 p 153-157 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 193-197 (For availability see N74-23226 14-23)
CSCL 07D

The practical results obtained as a result of filtering industrial chemical solutions under continuous flow conditions with the aid of an ultrasonic filter are presented. The main part of the assembly consists of an ultrasonic generator with an output power of about 400 W and the filtration assembly, in which there is a magnetostrictive amplifier constructed for 20.5 kHz. In addition to ensuring a continuous flow of filtered solution, ultrasonic filters can be replaced or cleaned at intervals of time that are 8-10 times greater than in the case of mechanical filters. They yield considerably better results as far as the size of the filtered particles is concerned. The parameters on which filtration quality depends are also presented. Author

N74-23251* Kanner (Leo) Associates, Redwood City, Calif.
MOLECULAR COMPRESSIBILITY OF SOME HALIDES IN ALCOHOLS c06
C. Serban and D. Auslaender *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 158-161 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 199-203 (For availability see N74-23226 14-23)
CSCL 07C

After measuring ultrasonic velocity and density, the molecular compressibility values from Wada's formula were calculated, for alkali metal halide solutions in methyl, ethyl, butyl, and glycol alcohol. The temperature and concentration dependence were studied, finding deviations due to the hydrogen bonds of the solvent. Author

N74-23252* Kanner (Leo) Associates, Redwood City, Calif.
THE MOLECULAR VELOCITY OF SOUND
D. Auslaender and L. Onitiu *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 162-165 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 205-209 (For availability see N74-23226 14-23)
CSCL 20A

The molecular velocity of sound was calculated according to Rao's formula and the temperature and concentration dependences of this value were studied in aqueous solutions of alkali and alkaline-earth halides. Study of relative association brought to light characteristic effects of ions. The variation of the relative association can be explained by a breaking of hydrogen bonds by ions and thermal agitation. Author

N74-23253* Kanner (Leo) Associates, Redwood City, Calif.
CHECKING THE STATISTICAL THEORY OF LIQUIDS BY ULTRAACOUSTIC MEASUREMENTS c06
V. N. Dima *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 166-171 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 211-216 (For availability see N74-23226 14-23)
CSCL 07D

The manner of theoretically obtaining radial distribution functions 9(r) for n-hexane as a function of temperature is described. With the aid of function g(r) the coefficient of dynamic viscosity and the coefficient of volumetric viscosity for temperatures ranging from 213 K to 273 K were calculated. With the aid of the two coefficients of viscosity the coefficient of absorption of ultrasounds in n-hexane referred to the square of the frequency was determined. The same values were measured experimentally. Comparison of theory with experiments resulted in satisfactory agreement. Author

N74-23254* Kanner (Leo) Associates, Redwood City, Calif.
INTERNAL PRESSURES AND MOLECULAR DIMENSIONS IN AQUEOUS SOLUTIONS OF SOME CHLORIDES c06
D. Auslaender, I. Lenart, E. Rus, and A. Ciupe *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 172-176 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 219-224 (For availability see N74-23226 14-23)
CSCL 07D

On the basis of measurements of the velocity of ultrasounds in aqueous solutions of some alkaline-earth chlorides ($MgCl_2$, $CaCl_2$, $BaCl_2$) the concentration and temperature dependences of the internal pressure were determined. Using these results, as well as surface tension measurements, the mean diameters of the molecular species as a function of concentration and temperature, were determined. Author

N74-23255* Kanner (Leo) Associates, Redwood City, Calif.
ANALYSIS AND SYNTHESIS OF A FLUID SONIC PULSE SYSTEM c14
M. Boita *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 177-182 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 227-231 (For availability see N74-23226 14-23)
CSCL 14B

A nonlinear sonic system is described that includes a delay line. Short-lived pulses with a high repetition frequency circulate through the system. The analysis was carried out by defining the reflection factor at the load and then dividing the input pulse according to duration into sections of appropriate width. The response was determined for each section, the response to the whole pulse being given by the sum of the responses at the sections. This makes it possible to broach the synthesis of a sonic system that will give an output pulse of the desired form. Author

N74-23256* Kanner (Leo) Associates, Redwood City, Calif.
ACOUSTIC PROPERTIES OF ORGANIC ACID MIXTURES IN WATER c06
I. Macavei, V. Petrisor, and D. Auslaender *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 183-188 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultransunete (Bucharest), 29-31 May 1973 p 233-238 (For availability see N74-23226 14-23)
CSCL 07D

The variation of the rate of propagation of ultrasounds in organic acid mixtures in water points to structural changes caused by interactions that take place under conditions of thermal agitation, at different acid concentrations. At the same time, a difference is found in the changes in velocity as a function of the length of the carbon chain of the acids in the mixture as a result of their effect on the groups of water molecules associated by hydrogen bonds. Author

N74-23257* Kanner (Leo) Associates, Redwood City, Calif.
ULTRASONIC VELOCITY AND ADIABATIC COMPRESSIBILITY IN DIOXANE-WATER MIXTURES c06
A. Ciupe and D. Auslaender *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 189-193 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 241-246 (For availability see N74-23226 14-23)
CSCL 07D

Using a method of diffraction of light on an ultrasonic beam, the velocity of ultrasounds and the adiabatic compressibility in dioxane-water mixtures were determined. The dependence of these quantities on the temperature (in the 15-50 C range) and on the concentration (0-100%) were studied. For each temperature there was found a velocity maximum and a compressibility minimum for a given value of the dioxane concentration. The different behavior of these mixtures is due to intense interactions between the molecules of the two liquids composing the mixture. Author

N74-23258* Kanner (Leo) Associates, Redwood City, Calif.
STUDY OF STRUCTURE DEFECT INTERACTIONS IN

ALUMINUM BY THE ACOUSTIC METHOD c17
I. I. Nicolaescu *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 194-198 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 249-254 (For availability see N74-23226 14-23)
CSCL 11F

Using echo pulse and resonance rod methods, internal friction in pure aluminum was studied as a function of frequency, hardening temperature, time (internal friction relaxation) and impurity content. These studies led to the conclusion that internal friction in these materials depends strongly on dislocation structure and on elastic interactions between structure defects. It was found experimentally that internal friction relaxation depends on the cooling rate and on the impurity content. Some parameters of the dislocation structure and of the diffusion process were determined. It is shown that the dislocated dependence of internal friction can be used as a method of nondestructive testing of the impurity content of high-purity materials. Author

N74-23259* Kanner (Leo) Associates, Redwood City, Calif.
ULTRASONIC EXAMINATION OF WELDED JOINTS OF GREAT THICKNESS IN MECHANICAL EQUIPMENT UNDER PRESSURE c15
N. Emil *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 199-203 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 257-262 (For availability see N74-23226 14-23)
CSCL 14D

The requirements involved in choosing ultrasonic devices, the factors that affect testing, and recommended calibration methods are discussed. The ultrasonic testing method is the only method that up to now permits detection of defects in welded joints of great thickness. The results are conditioned by the performances of the devices employed as well as by the degree of instruction of the personnel. Author

N74-23260* Kanner (Leo) Associates, Redwood City, Calif.
IMPROVEMENT OF ELECTRIC CHARACTERISTICS OF LEAD ACCUMULATORS UNDER THE ACTION OF ULTRASOUNDS c03
V. P. Mihu and I. Gavrila *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 204-209 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 265-269 (For availability see N74-23226 14-23)
CSCL 10C

Results are given of experiments conducted in order to improve the electric characteristics of lead accumulators by ultrasonic irradiation of their electrolytes. The experimental results discussed complete the research conducted on static Le2, Le3 and D. Quaiser cells whose solutions were irradiated beforehand with ultrasounds of the frequency of 1 MHz. It is demonstrated that the discharge currents and capacitances of the investigated cells keep to higher values even 1 year after ultrasonic irradiation of the electrolyte. The experimental results are discussed. Author

N74-23261* Kanner (Leo) Associates, Redwood City, Calif.
INFLUENCE OF ULTRASOUNDS ON ELECTROLYTIC POLISHING c15
I. Gavrila and N. Liuteanu *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 210-214 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 1973 p 271-275 (For availability see N74-23226 14-23)
CSCL 13H

On the basis of study of the electrolytic polishing of metal pieces, the following conclusions can be drawn: (1) Utilization of ultrasonically irradiated electrolytes in the electrolytic polishing of copper and steel pieces leads to enhanced polishing quality. (2) Polishing time for the reference pieces was twice as long as for the test pieces. (3) The chemical attack exerted on the surface of the test pieces in order to get the structure of the respective metal lasted less than half as long and yielded superior qualitative results in the copper as well as in the OT 60-2 steel test pieces polished with ultrasonically irradiated electrolytes. (4) The utilization of higher polishing current densities can be explained by the fact that the cavitational effect that arises in the electrolyte owing to ultrasounds contributes to an increase in the solution's electrical conductivity and elimination of gases from the electrolyte. Author

N74-23262* Kanner (Leo) Associates, Redwood City, Calif.
THE INFLUENCE OF STEEL ROUGHNESS AND GRANULATION ON THE ACCURACY OF PART THICKNESS MEASUREMENT BY MEANS OF ULTRASOUNDS c17
S. Sontea and M. Baltanoiu *In its* The 4th Natl. Conf. on Acoustics, Vol. 2 B (NASA-TT-F-15663) Apr. 1974 p 215-219 ref Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 277-282 (For availability see N74-23226 14-23)
CSCL 11F

Nondestructive measurement of the thickness of one-sided parts can be successfully conducted with the aid of ultrasounds. Using an ultrasonic defectoscope equipped with a highly precise device for thickness measurement, the experimental results obtained and the parameters that influence them are discussed. It is known that the manner of attaching the probe to the surface to be tested is influenced by the roughness of the surface. Likewise, in view of the fact that measurement results are influenced by the velocity of ultrasounds in the material to be investigated, they are also conditioned by the size of the structure. These factors and the manner in which they influence measurement results are also described. Author

N74-23263* Kanner (Leo) Associates, Redwood City, Calif.
INFLUENCE OF MOISTURE CONTENT ON THE VELOCITY OF ULTRASOUNDS IN BLACK POPLAR WOOD
V. Bucar (ICPIL, bucharest) and I. Facacaru (INCERC, Bucharest) *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 220-227 Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 285-293 (For availability see N74-23226 14-23)
CSCL 20A

Correlations among the longitudinal, radial and tangential velocities of ultrasounds in black poplar on the one hand and among these magnitudes and the wood's moisture content on the other hand are presented. Mathematical equations approximating these correlations are given, and the influence of moisture content on the elastic constants of wood is discussed. The possibility of using ultrasonic methods in automating the wood drying process and in testing the quality and homogeneity of wood is pointed out. Author

N74-23264* Kanner (Leo) Associates, Redwood City, Calif.
INFLUENCE OF ULTRASOUNDS ON SOME MECHANICAL PROPERTIES OF FIR WOOD (ABIES ALBA MILL). MICROSCOPIC SECTIONS
V. Parpala, A. Pastirnac, and N. Paraschiv *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 228-233 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 295-300 (For availability see N74-23226 14-23)
CSCL 20A

It was found that as a result of ultrasonic treatment fir wood (Abies alba Mill) shows the effects of homogenization, and the modulus of elasticity for static flexure drops on an average by 50% for 45 min of treatment. The drop is more pronounced for test pieces with 8 to 12 annual rings. Study of microscopic sections disclosed that early wood with one annual ring undergoes the most powerful effect. Author

N74-23265* Kanner (Leo) Associates, Redwood City, Calif.
RESEARCH ON WOOD BENDING IN A MACROSONIC FIELD c15
J. Filipovici, D. Mihai, S. Mihai, O. Dragan, and S. Ciovica *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 234-237 Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 303-308 (For availability see N74-23226 14-23)
CSCL 13H

Woodworking often requires the wood to be bent into different shapes. In view of the fact that macrosonic waves compress and expand the medium through which they are being propagated we assumed that wood subjected to the action of these waves during the bending process would have enhanced plasticity as a result of the loosening-up that takes place in it, as well as of the reduction in effort. To this effect, the bending of wood plasticized in a macrosonic field was studied. This bending took place under good conditions, and structural analyses conducted with the aid of an electron microscope proved initial premises to be correct. Applied on an industrial scale, this procedure would contribute to improving the technology of wood bending as well as to eliminating factory spoilage. Author

N74-23266* Kanner (Leo) Associates, Redwood City, Calif.
NEW EXPERIMENTAL CONTRIBUTIONS TO UNDERSTANDING THE EFFECT OF ULTRASONIC IRRADIATION ON TOMATOES c04
A. Elena *In its* The 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 238-242 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 311-316 (For availability see N74-23226 14-23)

Irradiation of Aurora 100 tomatoes by a hydrodynamic ultrasonic generator with a frequency of 25 kHz per sec intensifies seed germination and the growth of the plants, causing precosity and increasing the output by 15.63 to 37.65%. The most effective radiation time (between 20 and 40 min) intensifies the phenophases. It causes some increase in output and changes in the chemical compositions of the fruits. Author

N74-23267* Kanner (Leo) Associates, Redwood City, Calif.
THE ACTION OF ULTRASOUNDS ON BEZOSTAIA 1 WINTER WHEAT GROWN IN SAND POTS TREATED WITH KNOP SOLUTION c04
N. Albu *In its* the 4th Natl. Conf. on Acoustics, Vol. 2, B (NASA-TT-F-15663) Apr. 1974 p 244-249 refs Transl. into ENGLISH from A 4-A Conferinta Natl. de Acustica. Vol. 2, B: Ultrasunete (Bucharest), 29-31 May 1973 p 319-324 (For availability see N74-23226 14-23)
CSCL 06H

The results of 3 years of research are presented concerning the increase in length and weight of the aerial biomass as compared with the underground biomass, as well as the productivity indexes of Bezostaia 1 winter wheat. The experiment involved two varieties, each of them with nine repetitions. Sterile sifted sand treated several times with a Knop solution during the vegetative period was used as a seed bed. The seeds were kept in water for 2 hours before treatment. Biometric and statistical measurements showed significant responses in the treated varieties. Author

N74-23268*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF SIZE OF GLARE SOURCE ON DISABILITY GLARE AT SMALL GLARE ANGLES
E. Hartmann and Ch. Ucke Washington NASA May 1974 13 p refs Transl. into ENGLISH from Lichttechnik (Moscow), v. 26, no. 1, 1974 p 20-23
(Contract NASw-2481)
(NASA-TT-F-15581) Avail: NTIS HC $4.00 CSCL 20F

Within the area of disability glare, a summation formula is applicable to several discrete glare sources. The summation formula has been shown to be no longer valid at small glare angles. It is shown that for both circular and radial glare sources, the equivalent veiling luminance at constant glare angle and constant illumination of the cornea increases more rapidly with increasing glare-source brightness as the glare angle diminishes. Deviations from additivity are noted for glare angles less than 2 deg. Whereas the additivity of equivalent veiling luminance follows clearly from the theory of light scattering, the explanation for the nonadditivity of equivalent veiling luminance for very small glare angles is still uncertain at the present stage of knowledge. Author

N74-23269*# Kanner (Leo) Associates, Redwood City, Calif.
INERTIA OF LOUDNESS MEASUREMENT IN RELATION TO SOUND LEVEL
H. Niese Washington NASA May 1974 28 p refs Transl. into ENGLISH from Hochfrequenz-Technik und Elektroakustik (East Germany), v. 68, 1959 p 143-152
(Contract NASw-2481)
(NASA-TT-F-15584) Avail: NTIS HC $4.50 CSCL 20A

In order to simulate the properties of the ear for objective loudness-level meters, the ear is viewed as a closed inertial system with a time constant of 23 msec for acoustic power. This figure was determined through subjective loudness-comparison experiments. Two alternating short tones of different durations (ratio 1:2) were compared, and the loudness of one adjusted until it equalled that of the other. No dependence of the loudness rise on loudness level was ascertained. Two electrical circuits for appropriately designed loudness-level meters are described. Author

N74-23270*# Scientific Translation Service, Santa Barbara, Calif.
THE ANNOYANCE OF NOISE OF DIFFERENT BANDWIDTHS
K. Goesele and S. Koch Washington NASA Apr. 1974 27 p refs Transl. into ENGLISH from Acustica (West Germany), v. 20, 1968 p 324-333
(Contract NASw-2483)
(NASA-TT-F-15594) Avail: NTIS HC $4.50 CSCL 20A

To determine its annoyance, the noise to be tested was presented in furnished rooms in form of a permanent noise. This permanent noise was compared with inserted signals of broadband noise. Experimental results have demonstrated that the weighted sound pressure level and not the loudness level is representative of the annoyance. The discrepancy found by judging noise according to the loudness level is caused by the influence of room configuration and noise duration. Experimental results have shown that the judgment of noises corresponds less to the subjective impression than the judgment based on the sound pressure level. Author

N74-23271*# Scientific Translation Service, Santa Barbara, Calif.
AUDIBILITY LIMITS FOR AMPLITUDE AND FREQUENCY MODULATION OF A TONE
E. Zwicker Washington NASA May 1974 27 p refs Transl. into ENGLISH from Acustica (West Germany), v. 2, 1972 p AB125-AB133
(Contract NASw-2483)
(NASA-TT-F-15597) Avail: NTIS HC $4.00 CSCL 20A

Measurements have been made of the just perceptible amplitude modulation and the just perceptible frequency modulation of pure tones of different pitch and loudness level as a function of the modulating frequency. Below a certain modulating frequency the ear is able to distinguish between the two kinds of modulation and perceives the amplitude modulation much better. Above this phase limit frequency there is no perceptible difference between frequency modulation and amplitude modulation. The phase limit frequency has a value of about 30 Hz for low frequency tones and rises for 1 kHz for tones with a frequency of about 10 kHz. The influence of the frequency response of the transmission system upon the perceptibility of frequency modulation has been investigated. Author

N74-23272*# Scientific Translation Service, Santa Barbara, Calif.
THE INFLUENCE OF THE TEMPORAL STRUCTURE OF TONES ON THE ADDITION OF PARTIAL LOUDNESSES
E. Zwicker Washington NASA May 1974 27 p refs Transl. into ENGLISH from Acustica (Stuttgart), v. 21, 1969 p 16-25
(Contract NASw-2483)
(NASA-TT-F-15595) Avail: NTIS HC $4.50 CSCL 20A

Comparative measurements of loudness have been carried out with sound signals composed of five sound pulses of frequencies 1.0 kHz, 1.35 kHz, 2.5 kHz and 3.4 kHz. The dependence of loudness on the spectral distribution is measured. The dependence on the temporal structure of the sound is determined. The results confirm the integration of the partial loudnesses via pitch and the rating of the sound intensity over an RC element of 100 ms time constant. Finally, sound of spectral as well as of temporal structure is used. It is shown that, though an integration takes place, it is only complete via pitch. The measured results are interpreted qualitatively. Author

N74-23273*# Scientific Translation Service, Santa Barbara, Calif.
A COMPARISON OF METHODS FOR CALCULATING THE LOUDNESS LEVEL
E. Zwicker Washington NASA May 1974 18 p refs Transl. into ENGLISH from Acustica (Stuttgart), v. 17, 1966 p 278-284
(Contract NASw-2483)
(NASA-TT-F-15596) Avail: NTIS HC $4.00 CSCL 20A

The methods presently in use for calculating the loudness level yield differing results for the same sound spectrum. According to the three methods outlined the loudness level is calculated as a function of sound pressure level, bandwidth, center frequency, and slope of the third-octave level diagram, and the results are compared. The differences vary between 0 and 10 decibels depending on the nature of the sound. The divergences are not methodical. To gain a criterion for the actual, or subjectively perceived, loudness, measurements were made with 12 persons for several sounds which presented especially large differences among the calculated values. Author

N74-23274*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ACOUSTIC THEORY OF AXISYMMETRIC MULTISECTIONED DUCTS
William E. Zorumski Washington May 1974 36 p refs
(NASA-TR-R-419; L-9222) Avail: NTIS HC $3.25 CSCL 20A

Equations are developed for the acoustic field in a duct system which is made up of a number of connected circular and annular ducts. These equations are suitable for finding the acoustic field inside of and radiated from an aircraft turbofan engine. Acoustic modes are used as generalized coordinates in order to develop a set of matrix equations for the acoustic field. Equations for these modes are given for circular and annular ducts with uniform flow. Modal source equations are derived for point acoustic sources. General equations for mode transmission and reflection are developed and detailed equations are derived for ducts with multiple sections of acoustic treatment and for ducts with circumferential splitter rings. The general theory is applied to the special case of a uniform area circular duct with multisection liners and it is shown that the mode reflection effects are proportional to differences of the acoustic admittances of adjacent liners. A numerical example is given which shows that multisection liners may provide greater noise suppression than uniform liners. Author

N74-23275*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
HANDBOOK OF NOISE RATINGS Final Report
Karl S. Pearsons and Ricarda L. Bennett Washington NASA Apr. 1974 334 p refs
(Contract NAS1-11839)
(NASA-CR-2376; Rept-2419) Avail: NTIS HC $7.50 CSCL 20A

The handbook was compiled to provide information in a concise form, describing the multitude of noise rating schemes. It is hoped that by describing the noise rating methods in a single volume the user will have better access to the definitions, application and calculation procedures of the current noise rating methods. Author

N74-23276*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
RELATION BETWEEN NEAR FIELD AND FAR FIELD ACOUSTIC MEASUREMENTS
David A. Bies and Terry D. Scharton 29 Mar. 1974 73 p refs
(Contract NAS2-6726)
(NASA-CR-114756; BBN-2600) Avail: NTIS HC $6.75 CSCL 20A

Several approaches to the problem of determining the far field directivity of an acoustic source located in a reverberant environment, such as a wind tunnel, are investigated analytically and experimentally. The decrease of sound pressure level with distance is illustrated; and the spatial extent of the hydrodynamic and geometric near fields, the far field, and the reverberant field are described. A previously-prosposed analytical technique for predicting the far field directivity of the acoustic source on the basis of near field data is investigated. Experiments are conducted with small acoustic sources and an analysis is performed to determine the variation with distance from the source of the directionality of the sound field. A novel experiment is conducted in which the sound pressure measured at various distances from an acoustic driver located in the NASA Ames 40 x 80 ft wind tunnel is crosscorrelated with the driver excitation voltage. Author

N74-23277# Harry Diamond Labs., Washington, D.C.
THE INTERACTION OF FINITE SIZE BEAMS OF LIGHT AND MODULATED SOUND, PART 1
Dominick A. Giglio Jul. 1973 109 p refs
(DA Proj. 1W2-62301-A-207)
(AD-775800; HDL-TR-1638) Avail: NTIS CSCL 20/6

In the first part of a two-part report the interaction of finite size beams of light and sound is investigated by means of an integral formulation of the diffraction problem. The integral equations are derived from Maxwell's equations and are shown to have a physical interpretation which relates to the reradiation from induced dipole sources. The analysis is conducted for several useful cases involving Gaussian and/or uniform beam profiles, resulting in general expressions for the first-order diffracted fields and power. These results are investigated in terms of the geometric parameters of the system and also with respect to the acoustic frequency. A generalized picture of the interaction is obtained by which critera for the observance of the so-called different types of diffraction are precisely defined. Some discussion of the optical response to modulated sound waves is given, but more thorough analysis of this problem is reserved for Part II. The analytical work is supplemented by physical arguments and interpretations in an attempt to present a full picture of the interaction. Author (GRA)

N74-23278# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
DESIGN AND REALIZATION OF ROTATING MACHINES SUBMERGED IN CRYOGENIC FLUID
J. Rival Nov. 1973 161 p In FRENCH
(CEA-R-4517) Avail: AEC Depository Libraries HC $10.25

The basic elements for a rotating machine submerged in cryogenic fluid were studied. The bearing rolling elements are the angular contact type and have bronze-filled Teflon separators. The electric motor is 3-phase, asychronous, squirrel-cage. The output power is 500 W at 300 K and 1200 W at 20 K. For these temperatures the iron losses increase for 20%, but the efficiency reaches 90%. A pump may be built with these specifications. The characteristics are given for liquid hydrogen. Other materials may be used in a closed loop or a transfer line. Author (NSA)

N74-23279# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
CALCULATION OF RADIATION LOSSES IN CYLINDER SYMMETRIC HIGH PRESSURE DISCHARGES BY MEANS OF A DIGITAL COMPUTER
F. J. Andriessen, W. Boerman, and I. F. E. M. Holtz Aug. 1973 59 p refs
(TH-73-E-38; ISBN-90-6144-038-6) Avail: NTIS HC $6.00

A computer program was developed for the calculation of the radiation balance in a cylinder symmetric discharge. Investigations carried out on wall-stabilized electric arcs in nitrogen and argon has shown the radiative energy transfer is no longer negligible when the central temperature rises above about 12,000 K. In particular, the energy transfer by means of UV radiation, subject to reabsorption in the discharge, plays an important part in the total energy balance of the discharge. ESRO

N74-23280# Maryland Univ., College Park. Dept. of Electrical Engineering.
THE STUDY OF THE INTERACTION OF INTENSE PICOSECOND LIGHT PULSES WITH MATERIALS Final Report, 23 Dec. 1969 - 21 Jun. 1973
Chi Hsing Lee 15 Feb. 1974 15 p refs
(Grants DA-ARO(D)-31-124-70-G50;
DA-ARO(D)-31-124-71-G55; DA-ARO(D)-31-124-72-G82;
ARPA Order 675)

(AD-775825) Avail: NTIS CSCL 20/5

The report contains the summary of the works performed in the entire period of this grant. The two-photon and three-photon photoconductivity effects in various semiconductors were studied. The effect was then applied to measure the ultrashort optical pulses. Two-photon pump GaAs bulk laser action was demonstrated. A theoretical calculation on the optical third harmonic generation with broad band picosecond pulses was made. Finally various aspects of the nonlinear optical interaction at the boundary of nonlinear media were investigated. The data agreed well with Bloembergen and Pershan's theory. The observation of the nonlinear Brewster's angle was reported for the first time in a transparent medium. Author (GRA)

N74-23281# Naval Ordnance Lab., White Oak, Md.
THE INFRARED EXTENDED, GATES CCI (CHARGE COUPLED IMAGER)
Peter K. Scharnhorst 3 Jan. 1974 32 p refs
(AD-775896; NOLTR-73-2) Avail: NTIS CSCL 17/5

The imaging capabilities of an infrered (IR) extended, integrating charge coupled imager (CCI) with a gated input are discussed with reference to the conventional silicon CCI. A photoconductive input circuit is considered and the dependence of device characteristics on the material parameters of the photosensor and the input channel are discussed. The input characteristics are illustrated with the aid of the photosensor-substrate combination consisting of amorphous GeTe and silicon, respectively. Since the essential difference between this device and the conventional silicon CCI is the input circuit, the discussion centers on the signal to noise ratio of the input section. (Modified author abstract) GRA

N74-23282# Naval Ordnance Lab., White Oak, Md.
PREPARATION AND PROPERTIES OF PbS-Si HETEROJUNCTIONS FOR INFRARED CHARGE COUPLED IMAGING Final Report, May 1972 - Nov. 1973
R. N. Lee, Peter K. Scharnhorst, and R. B. Schoolar 7 Jan. 1974 24 p refs
(AD-775895; NOLTR-73-213) Avail: NTIS CSCL 17/5

Narrow bandgap-silicon heterojunctions are examined theoretically and experimentally to assess the feasibility of extending charge coupled devices (CCD) imaging to the infrared. Ultra-high vacuum deposition of PbS on silicon is made using both direct sublimation and hot-wall film growth techniques. Substrate preparation in vacuum is discussed and the dependence of film properties on growth parameters is presented. Measurements of I-V, C-V and photoresponse characteristics of the PbS-Si heterojunctions are presented. Author (GRA)

N74-23283# California Univ., Los Angeles. Dept. of Physics.
THIRD SOUND VELOCITY AND ATTENUATION BELOW 1.2 DEGREES KELVIN
John Henry Scholts Dec. 1973 153 p refs
(Contract N00014-69-A-0200-4014; NR Proj. 384-302)
(AD-775899; TR-37) Avail: NTIS CSCL 20/13

The velocity of third sound on glass and CaF2 substrates and at a variety of film thicknesses has been measured using a He3 cryostat from temperatures of 1.2K down to 0.5K. Then with a dilution refrigerator the results on glass were extended to 0.1K. The third sound was generated and detected thermally in the usual manner, and the velocity was determined by measuring the time of flight of a pulse. Film thicknesses are found by measuring the chemical potential of the film at 1.5K. Third sound has now been ovserved in films as thin as 2.1 atomic layers, and hence indicates the existence of superfluidity in two dimensional systems. The attenuation of third sound on glass has been measured as a function of frequency at temperatures from 1.2K down to 0.7K and over a variety of film thicknesses. (Modified author abstract) GRA

N74-23284# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
IONIZING NOISE IN INFRARED SENSORS Instrumentation Papers
Virgil E. Vickers, Freeman D. Shepherd, Jr., and Edward A. Burke 13 Dec. 1973 15 p refs
(AD-775987; AFCRL-TR-73-0750; AFCRL-IP-207) Avail: NTIS CSCL 17/5

A model is described for the effects of gamma-induced ionizing noise in infrared sensors, taking into account the incident gamma spectrum, both Compton events in the detector and secondary hot electrons from the metal surroundings, partial or total deposition of the initial hot electron energy, detector geometry, and preamplifier impulse response. The model as coded gives predicted pulse height distributions and, for threshold-gating type circumvention, predicted duty cycles; it indicates that detector volume should be minimized. Good agreement with experimental results is achieved. Author (GRA)

N74-22648 Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
REPRESENTATION OF HOT JET TURBULENCE BY MEANS OF ITS INFRARED EMISSION
Jean Francois DeBelleval and Mariano Perulli *In* AGARD Noise Mech. Mar. 1974 10 p refs In FRENCH; ENGLISH summary (For availability see N74-22640 14-02)

N74-22651 Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
SOME EXPERIMENTAL OBSERVATIONS OF THE REFRACTION OF SOUND BY ROTATING FLOW
G. D. Butler, T. A. Holbeche, and P. Fethney *In* AGARD Noise Mech. Mar. 1974 10 p refs (For availability see N74-22640 14-02)

N74-22652 General Electric Co., Schenectady, N.Y. Mechanical Engineering Lab.
THE ISSUE OF CONVECTIVE AMPLIFICATION IN JET NOISE
Ramani Mani *In* AGARD Noise Mech. Mar. 1974 12 p refs Sponsored in part by Air Force (For availability see N74-22640 14-02)

N74-23440 Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
MAGNETIC PARTICLE TESTING
Eberhard Dickhaut *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 485-493 refs (For availability see N74-23413 14-32)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-23285 Wisconsin Univ., Madison.
TEMPERATURE AND EMISSION-LINE STRUCTURE AT THE EDGES OF H 2 REGIONS Ph.D. Thesis
Dipankar Chandra VasuMallik 1973 93 p
Avail: Univ. Microfilms Order No. 74-3534

Models of ionization fronts surrounding H 2 regions are computed with the assumption of steady flow in the reference frame of the front. These ionization fronts satisfy the weak D condition which is appropriate for fronts preceded by a shock in the H 1 region. Hydrogen, helium, nitrogen, and oxygen are the only elements considered in these models. Charge exchange between protons and neutral oxygen and nitrogen atoms were included. Effects of magnetic forces and dust were neglected. Since the energy input time is smaller than the cooling time associated with the emission of forbidden lines, the gas is heated to a high temperature immediately following ionization. At the trailing edge of the front the temperature decreases and the ionized gas merges with the main bulk of the nebula where the physical processes are in equilibrium. The emission in O 2 and N 2 lines are greatly enhanced because of the high temperature at the front. Dissert. Abstr.

N74-23286 Rutgers Univ., University Park, N.J.
MANY-BODY AND SURFACE EFFECTS IN SOLIDS: PLASMON EFFECTS IN HIGH ENERGY SPECTROSCOPY Ph.D. Thesis

Jhy Jiun Chang 1973 101 p
Avail: Univ. Microfilms Order No. 74-8768

The plasmon effects in various experiments of high-energy spectroscopies involving the excitation of a deep core electron have been investigated . The effect due to the presence of the solid surface are considered. A simple model in which the plasmons are treated as good elementary excitations was used. Ignoring the recoil of the deep core electron, the spectral density of the deep core state is calculated. The plasmon effects associated with the energy loss of the fast electron and the interference between the fast electron and the interference between the fast electron and deep core hole left behind are examined in many-body perturbation theory. The results of this work are in qualitative agreement with the recent experimental data. Dissert. Abstr.

N74-23287 Brown Univ., Providence, R.I.

THE THEORY OF PRESSURE INDUCED ROTATIONAL SPECTRA OF SYMMETRIC AND SLIGHTLY ASYMMETRIC ROTORS Ph.D. Thesis

Judith Ora Zwicker 1973 132 p
Avail: Univ. Microfilms Order No. 74-3100

The theory developed by Van Kranendonk and Kiss relating the binary integrated absorption coefficient to the induced diopole matrix elements for linear molecules is expanded to include symmetric and slightly asymmetric rotors. It is assumed that only quadrupole induced dipole moments contribute significantly to the absorption for nonpolar molecules and that the polarizability is isotropic. The quadrupole field is expanded in terms of direction cosines and expressed in terms of the components of the quadrupole moment tensor. The matrix elements are evaluated using the work of Cross Hainer and King expressing the symmetric rotor matrix elements of direction cosines in terms of the quantum numbers J, K and M. The theoretical results are applied to the specific symmetric rotors CH3F and CHF3 and to the slightly asymmetric rotor C2H4. Mixtures of these gases with Ar and Xe are discussed, making the assumptions of isotropic polarizability and a radial Lennard-Jones potential reasonable.
Dissert. Abstr.

N74-23288*# Georgia Inst. of Tech., Atlanta. School of Physics.

ANGULAR DISTRIBUTION OF PHOTOELECTRONS FROM ATOMIC OXYGEN, NITROGEN, AND CARBON

Steven T. Manson (Ga. State Univ., Atlanta), David J. Kennedy, Anthony F. Starace (Nebr. Univ.), and Dan Dill (Boston Univ.) [1974] 21 p refs
(Grants NGR-28-004-021; NSF GP-38905)
(NASA-CR-138391) Avail: NTIS HC $4.25 CSCL 20H

The angular distribution of photoelectrons from atomic oxygen is investigated using Hartree-Fock (HF) wave functions. The correct formulation is used to compare HS and HF results. Agreement between these results is good and the HS calculations have been extended to atomic nitrogen and carbon as well. Author

N74-23289*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EVIDENCE OF CHARGE EXCHANGE PUMPING IN CALCIUM-XENON SYSTEM

Donald L. Chubb 1973 22 p refs Presented at 26th Ann. Gaseous Electron. Conf., Madison, Wis., 16-19 Oct. 1973; sponsored by Am. Phys. Soc.
(NASA-TM-X-71530; E-7932) Avail: NTIS HC $4.25 CSCL 20H

Charge exchange between xenon ions and calcium atoms may produce an inversion between the 5s or 4d and 4p energy levels of the calcium ions. A low power flowing xenon plasma seeded with calcium was utilized to determine if charge exchange or electron collisions populate the 5s and 4d levels Ca(+). Line intensity ratios proportional to the density ratios n5s/n4p and n4d/n4p were measured. From the dependence of these intensity ratios on power input to the xenon plasma it was concluded that charge exchange pumping of the 5s and 4d levels predominates over electron collisional pumping of these levels. Also, by comparing intensity ratios obtained using argon and krypton in place of xenon with those obtained in xenon the same conclusion was made. Author

N74-23290*# Stanford Univ., Calif. Radioscience Lab.

AMPLITUDE VARIATIONS OF WHISTLER-MODE SIGNALS CAUSED BY THEIR INTERACTION WITH ENERGETIC ELECTRONS OF THE MAGNETOSPHERE

L. C. Bernard Dec. 1973 113 p refs
(Grant NGL-05-020-008; Contract F44620-72-C-0058)
(NASA-CR-138241; TR-3465-2; SU-SEL-73-043) Avail: NTIS HC $8.75 CSCL 20H

Whistler mode waves that propagate through the magnetosphere exchange energy with energetic electrons by wave-particle interaction mechanisms. Using linear theory, a detailed investigation is presented of the resulting amplitude variations of the wave as it propagates. Arbitrary wave frequency and direction of propagation are considered. A general class of electron distributions that are nonseparable in particle energy and pitch-angle is proposed. It is found that the proposed distribution model is consistent with available whistler and particle observations. This model yields insignificant amplitude variation over a large frequency band, a feature commonly observed in whistler data. This feature implies a certain equilibrium between waves and particles in the magnetosphere over a wide spread of particle energy, and is relevant to plasma injection experiments and to monitoring the distribution of energetic electrons in the magnetosphere. Author

N74-23291*# Kanner (Leo) Associates, Redwood City, Calif.

BROADENING OF SPECTRAL LINES IN A HOMOGENEOUS (COUPLING WIDTH)

V. Furtsev and A. Vlasov Washington NASA Jun. 1974 42 p refs Transl. into ENGLISH from Physik. Z. Sowietunion (Kharkov), v. 10, no. 3, 1936 p 378-412
(Contract NASw-2481)
(NASA-TT-F-15621) Avail: NTIS HC $5.25 CSCL 20H

The pronounced broadening which accompanies an increase in the density of the principal gas is explained. This increase is caused by the enhanced decay of the atom resulting from a loss of energy to neighboring atoms and by a change in oscillation amplitude. The problem is considered in terms of classical and quantum theory. The effect of radiation during collision upon the form and width of lines is studied qualitatively and yields an additional asymmetric broadening effect. Author

N74-23292*# Wisconsin Univ., Madison. Theoretical Chemistry Inst.

NOTE ON THE SYMMETRY OF PERTURBED HARTREE-FOCK AND X-ALPHA WAVEFUNCTIONS

John O. Eaves and Saul T. Epstein 29 Mar. 1974 10 p refs
(Grants NGL-50-002-001; NSF GP-28213)
(NASA-CR-138259; WIS-TCI-509) Avail: NTIS HC $4.00 CSCL 20H

It is shown that the first order orbitals for X-alpha or Hartree-Fock atoms perturbed by multipole electric fields have the expected symmetry properties. Author

N74-23293# Kyoto Univ. (Japan). Research Inst. for Fundamental Physics.

COLOR CONSTRAINT ON URBARYON REARRANGEMENT DIAGRAM

Masahiro Imachi, Shoichiro Otsuki (Kyushu Univ.), and Fumihiko Toyoda (Kyushu Univ.) Mar. 1974 8 p refs
(RIFP-188) Avail: NTIS HC $4.00

The physical meaning of the color orientation omega sup C is discussed and its quantum number orientation is defined. Data are also given on the regulation of the urbaryon rearrangement membrane in strong interactions by the quantum members omega sup T and omega sup C. E.H.W.

N74-23294# National Research Council of Canada, Ottawa (Ontario). Translation Services.

PRODUCTION OF HIGHLY STRIPPED IONS IN ULTRA-HIGH-VACUUM ELECTRON-BEAM SOURCE

E. D. Donets, V. I. Ilyushchenko, and V. D. Alpert 1974 15 p refs Transl. into ENGLISH from the publ. "Soobshcheniya Obedinennogo Instituta Yadernykh Issledovanii" Dubna, USSR 1969 16 p
(NRC-TT-1748) Avail: NTIS HC $4.00

Ions having the following charges: C(+5), N(+6), O(+7) were observed at the output of the electron-beam ion source by working with the residual gas atoms. Detection of bare nuclei of C, N and O was made difficult due to the presence of intense H2(+) line. In preliminary experiments on gold ionization the ions up to Au(+19) were obtained. The experiment value of the ionization cross section N(+5) yields N(+6), which turned out to be anomalously large, is discussed. Author

N74-23295# Intelcom Rad Tech, San Diego, Calif.
MOLECULAR BEAM STUDIES OF ATOMIC COLLISIONS Final Report, 1 Sep. 1969 - 31 Dec. 1973
R. H. Neynaber 28 Feb. 1974 15 p refs
(Contract N00014-70-C-0037; NR Proj. 012-115)
(AD-774943; RT-8007-004) Avail: NTIS CSCL 07/4

A summary of the research performed over the period 1 September 1969 - 31 December 1973 is presented. Most of the work consisted of studies of ion-molecule reactions by merging-beams techniques. Species involved included Ba, O, N2, O2(+), NO(+), N2(+), N(+), and O(+). In addition, a study was made of associative ionization in collisions of He(*) with H2. (Modified author abstract) GRA

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-23296 Brown Univ., Providence, R.I.
OSCILLATIONS IN A SOLID STATE PLASMA WITH PERIODIC DENSITY VARIATION Ph.D. Thesis
Rodolfo Guillermo Silberstein 1973 115 p
Avail: Univ. Microfilms Order No. 74-3073

The possibility of building a generator in the millimeter region of the spectrum, based on the instability of a nonuniform solid state plasma in a semiconductor is studied. To that end the possibility of the existence of an instability in a periodically doped inifinte semiconductor is analyzed. It is also suggested that type of instability may be the cause for the observed emission from samples of InSb subject to applied electric fields. The study of the mentioned instability requires solving Boltzmann's equation in a medium with periodic density variation. The model proposed consists of high mobility electrons in an infinite one-dimensional medium that is doped periodically and is subjected to an external dc electric field. No external magnetic fields were considered so that the current will flow in only the longitudinal direction. Einstein's relation for the electric field across a junction was assumed to hold and Boltzmann's equation was linearized. Collision effects were neglected for the ac part of the linearized equation. Dissert. Abstr.

N74-23297 Cornell Univ., New York.
THE INTERACTION OF A RELATIVISTIC ELECTRON BEAM AND A FULLY IONIZED PLASMA Ph.D. Thesis
Frederick Lee Sandel 1973 122 p
Avail: Univ. Microfilms Order No. 74-6384

The interaction was studied for the case of a quiescent plasma. When the beam is injected into a current-carrying, highly turbulent plasma, the heating is found to depend strongly on the direction of the turbulent heating current, with greater heating resulting when the turbulent heating current flows in the same axial direction as the beam return current. A comparison of beam plasma heating and direct turbulent heating at similar heating current levels was also made. Evidence is presented for identifying turbulent dissipation of the beam return current as a mechanism responsible in part for the energy transfer in beam heating. The operation and characteristics of foil-less field emission diodes are discussed, and the effect of variation of magnetic mirror field strength on the beam heating process is shown. Characteristic emission of hard X-rays and microwave and far-infrared radiation is noted and discussed. Dissert. Abstr.

N74-23298 Wisconsin Univ., Madison.
LOWER HYBRID RESONANCE HEATING IN A HOT ELECTRON PLASMA Ph.D. Thesis
Philippe Andre Raimbault 1973 189 p
Avail: Univ. Microfilms Order No. 74-3547

Several theories were found to explain heating at this frequency: collisional absorption; linear mode conversion; and nonlinear parametric effects. An electron cyclotron resonance mirror confined plasma was observed to absorb an incident lower hybrid resonant wave by the process of linear mode conversion. The r.f. power was found to transfer primarily to the electrons, but under certain circumstances, i.e., when the electron absorption was decreased, to the ions as well. It was also found that the electron absorption characteristics are very similar to those for lower off resonance heating. Electron Landau damping along the field lines can account for this effect as well. Dissert. Abstr.

N74-23299*# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.
DIAGNOSTICS OF SEEDED RF PLASMAS: AN EXPERIMENTAL STUDY RELATED TO THE GASEOUS CORE NUCLEAR REACTOR Final Report, 1 Sep. 1971 - 31 Jul. 1973
S. D. Thompson, J. D. Clement, and J. R. Williams 31 Jul. 1973 137 p refs
(Grant NGR-11-002-146)
(NASA-CR-138240) Avail: NTIS HC $10.00 CSCL 20I

Measurements of the temperature profiles in an RF argon plasma were made over magnetic field intensities ranging from 20 amp turns/cm to 80 amp turns/cm. The results were compared with a one-dimensional numerical treatment of the governing equations and with an approximate closed form analytical solution that neglected radiation losses. The average measured temperatures in the plasma compared well with the numerical treatment, though the experimental profile showed less of an off center temperature peak than predicted by theory. This may be a result of the complex turbulent flow pattern present in the experimental torch and not modeled in the numerical treatment. The radiation term cannot be neglected for argon at the power levels investigated. The closed form analytical approximation that neglected radiation led to temperature predictions on the order of 1000 K to 2000 K higher than measured or predicted by the numerical treatment which considered radiation losses. Author

N74-23300# Sandia Labs., Albuquerque, N.Mex.
RESEARCH ON THE PARAMETERS AND DYNAMICS OF LASER PLASMA
V. A. Boiko, O. N. Krokhin, and G. V. Sklizkov Sep. 1973 94 p refs Transl. into ENGLISH from the Russian report Sponsored by AEC
(SLA-73-6003) Avail: NTIS HC $6.75

Experimental research on the hot plasma of the laser flame is reviewed. The different space-time interrelationships of the laser plasma's basic parameters and their relation to the characteristics were performed with the laser beam in sharp focus on a thick target. Author (NSA)

N74-23301# Centre National de la Recherche Scientifique, Meudon (France).
GENERALIZED EULER AND NAVIER-STOKES EQUATIONS FOR A PLASMA WITH STRONG THERMODYNAMIC DISTURBANCE [EQUATIONS D'EULER ET NAVIER-STOKES GENERALISEES AU CAS D'UN PLASMA EN ASSEZ FORT DESEQUILIBRE THERMODYNAMIQUE]
Bertrand Rowe Sep. 1973 60 p refs In FRENCH
(Publ-463) Avail: NTIS HC $6.00

Low-density, low-energy, highly-ionized plasmas were studied in terms of transport equations. The rms of the kinetic equations are not made explicit and the transport equations are written in the most general way with a moving coordinate reference set of arbitrary velocity. This generalization leads to Euler type equations if the lms of the kinetic system do not include space gradients, and to Navier-Stokes equations in the converse case. A further distinction appears in the collision terms according to the process velocities. ESRO

N74-23302# European Space Research Organization, Paris (France).
METHODS FOR THE CALCULATION OF THE COMPONENTS OF THE ELECTRICAL CONDUCTIVITY AND THE TOTAL RADIATION OF PLASMAS IN LOCAL THERMODYNAMIC EQUILIBRIUM
A. W. Neuberger Mar. 1974 121 p refs Transl. into ENGLISH

of Methoden zur Berechnung der Komponenten der Elek. Leitfaehigkeit und der Gesamtstrahlung thermischer Plasmen, DLR-FB-73-51, DFVLR, 1973
(ESRO-TT-36; DLR-FB-73-51) Avail: NTIS HC $9.25; DFVLR, Porz, West Ger. 35,80 DM

The composition of a nitrogen plasma in local thermodynamic equilibrium at temperatures between 1000 K and 30,000 K and pressures between 0.05 atm and 100 atm is calculated. Using the obtained plasma composition, the electrical conductivity and the continuum radiation are determined. These are essentially in better agreement with known measurements, than the theoretical results. A semiempirical equation for the determination of the line radiation is derived. With it, also calculation of the total radiation as a function of pressure and temperature is possible. Author (ESRO)

N74-23303# Miami Univ., Coral Gables, Fla. Dept. of Physics.
VORTEX STRUCTURES FOR THERMONUCLEAR POWER Final Report
Daniel R. Wells Feb. 1974 9 p refs
(Grant AF-AFOSR-2295-72; AF Proj. 9752)
(AD-776014; AFOSR-74-0350TR) Avail: NTIS CSCL 20/9

The high density plasma group studied the hot plasma produced when two plasmoids, each generated by a conical theta pinch, collide in the presence of a mirror magnetic field. Diagnostic facilities are described. Construction of TRISOPS III with secondary compression mirrors is complete. GRA

N74-23304# Army Foreign Science and Technology Center, Charlottesville, Va.
NON-STEADY-STATE FLOWS IN THE CHANNEL OF AN MHD-GENERATOR
G. R. Alavidze and V. M. Paskonov 29 Jan. 1974 11 p refs Transl. into ENGLISH from Vychislitelnye Metody i Programmirovanie (Moscow), no. 15, 1970 p 103-109
(AD-776172; FSTC-HT-23-199-73) Avail: NTIS CSCL 20/9

The one-dimensional gasdynamic equations for an inviscid conducting gas in an MHD channel are set up for constant B and (Re sub m) much < 1, and solved by a finite-difference method for the transient from steady-state no-load (load parameter K = 1) to k = 0.5. GRA

N74-23305# Harry Diamond Labs., Washington, D.C.
CORRECTIONS TO WAVEGUIDE-PROBE MEASUREMENTS OF PLASMA TEMPERATURE
A. Singer and J. M. Minkowski May 1973 26 p refs
(DA Proj. 1T0-61101-A-91A; HDL Proj. A10376)
(AD-775791; HDL-TR-1620) Avail: NTIS CSCL 20/9

Two major corrections are made to the Aro-Walsh determination of electron temperature of shock-heated plasma by means of microwave techniques. One correction concerns the reference level in the measurement of the plasma radiation temperature by means of the waveguide probe technique; it has the effect of consistently raising the experimentally determined electron temperature, yielding closer agreement between theory and experiment in the region of Mach 8.5 to 10.5. More importantly, the correction enhances the prominence of the region in which the results of this technique exceed the theoretical values, so that between Mach 7.9 and 8.5 the corrected waveguide probe results exhibit the same type of anomalous form as those obtained earlier by microwave horns. The second correction concerns Aro and Walsh's comparison of the electron plasma temperatures obtained by the waveguide probe with those obtained by microwave horns. (Modified author abstract) GRA

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-23306 Turku Univ. (Finland). Wihuri Physical Lab.
ON F-AGGREGATE BANDS IN ADDITIVELY COLOURED KCl(x)Br(1-x)
Mikko Hovi and Markku Paasio Helsinki Suomalainen Tiedeakatemia 1973 15 p refs
Copyright. Avail: Issuing Activity

Single crystals of various compositions of the system KCl(x)Br(1-x) were coloured additively in potassium vapour. F,M, R(1),R(2), and N(1) absorption bands were studied. The dependences of the spectral positions and half widths on composition were measured at room temperature and near liquid nitrogen temperature. The results are qualitatively similar to those obtained previously for the system K(x),Rb(1-x)I. The spectral positions of all bands do not vary linearly with composition but deviate towards lower energy, except the R(2)-band which has a slight deviation towards higher energy. The half widths of the F- and M-bands are larger than the linear dependence on composition would imply. Author

N74-23307 Princeton Univ., N.J.
CHARGE TRAPPING EFFECTS IN THIN FILMS OF Al2O3 AND SiO2 Ph.D. Thesis
Eliyahou Harari 1973 265 p
Avail: Univ. Microfilms Order No. 74-9688

Electron and hole traps in MIS devices with pyrohydrolytic Al2O3 gate insulator have been investigated, using the MIS device as an integral detector of the charge stored in the oxide. Five electron and four hole trap levels were discovered in the oxide forbidden gap. Their relative densities, spatial distributions in the oxide, capture cross sections and recombination rates have been investigated and are shown to control the device behaviour under ionizing radiation. With a positive gate bias the device radiation hardness is seen to arise from enhanced injection of electrons from the silicon conduction band followed by recombination with excess holes trapped in the oxide. The same detection technique has been used to investigate ionizing radiation-induced charge trapping effects in thin films of SiO2 incorporated into MIS capacitor structures. For irradiation at room temperature it appears that holes are lattice trapped at immobile sites with energy at the upper edge of the valence band.
Dissert. Abstr.

N74-23308 Syracuse Univ., N.Y.
THERMIONIC EMISSION PARAMETERS OF TANTALUM (100) AND TANTALUM (211) Ph.D. Thesis
Donald Joseph Nicholson 1973 161 p
Avail: Univ. Microfilms Order No. 74-8361

Two single crystal Tantalum ribbons having nominal impurity content of 30 ppm were incorporated as the interchangeable emitter and collector in a Shelton geometry tube, the tube was housed in a baked stainless steel chamber incorporating both ion and titanium sublimation pumps, and routinely pumped to a residual background pressure of 3 x 10 to the minus 11 power were flashed at 2700K by resistive heating prior to all measurements. The electron reflection coefficients for the two crystals were measured in the range of incident electron energy of 0-80 eV, observed to be a reproducible feature of the surfaces flashed to the above temperature, and the similarities with such coefficients measured for the same faces of tungsten noted.
Dissert. Abstr.

N74-23309 Oklahoma State Univ., Stillwater.
PULSED FIELD GALVANOMAGNETIC MEASUREMENTS ON ZINC OXIDE Ph.D. Thesis
Walter Claud Rhodes, Jr. 1973 78 p
Avail: Univ. Microfilms Order No. 74-8107

The electronic conduction properties of single crystals of the semiconductor zinc oxide were studied by making galvanomagnetic measurements in pulsed magnetic fields up to 200 kilogauss. All measurements were made at room temperature. The measurements and analysis of the galvanomagnetic effects were done using a phenomenological approach. Onsager's relations and the symmetry requirements of the material were used to identify the independent nonzero coefficients and to define the crystal orientations best suited to the experiment. Only two crystals, cut so that their current axes were orthogonal to each other, were required to evaluate the 10 independent coefficients. The single ellipsoid model for the conduction band was chosen to explain the observed galvanomagnetic properties. The model assumes that the conduction band is composed of a single valley which is parabolic and has an ellipsoid of revolution for surfaces of constant energy. Dissert. Abstr.

N74-23310 Notre Dame Univ., Ind.
ELECTRON TUNNELING INTO THICK SINGLE CRYSTAL ALUMINUM FILMS Ph.D. Thesis
Lawrence Stamper Darken, Jr. 1974 144 p
Avail: Univ. Microfilms Order No. 74-8894

Nine acceptable tunneling junctions were fabricated. Two exhibited weak but discernibly oscillatory structure in the tunneling density of states. The periodicity of the structure as the dependence of the amplitude on temperature and energy are consistent with the interpretation of this structure as Tomasch oscillations. The values of the Fermi velocities determined are: V sub f(111) = 3.0 + or - 0.2 x 10 to the 7th power cm/sec, V sub f(100) = 8.8 + or - 0.6 x 10 to the 7th power cm/sec. Specific heat and anomalous skin effect measurements indicate that the average Fermi velocity over the entire Fermi surface is about 13 x 10 to the 7th power cm/sec. Dissert. Abstr.

N74-23311 Cornell Univ., New York.
EQUILIBRIUM CARBON SEGREGATION TO A NICKEL (111) SURFACE: A SURFACE PHASE TRANSITION Ph.D. Thesis
James Churchill Shelton, III 1973 168 p
Avail: Univ. Microfilms Order No. 74-6350

Equilibrium segregation of carbon to the (111) surface of nickel doped with 0.3 atom % carbon as a function of temperature is studied and the transition between equilibrium phases of the surface is identified. The surface carbon concentration was monitored as a function of temperature by Auger spectroscopy in cylindrical mirror and retarding field analyzers. Graphical results are presented for spectra attenuation by an overlayer as functions of the layer thickness, inelastic mean free path, and crystal analyzer geometry for the cylindrical mirror analyzer and for the retarding field analyzer. Dissert. Abstr.

N74-23312 Suomalainen Tiedeakatemia, Helsinki (Finland).
TWINNING IN THE ORDERED NgCd
P. Paalassalo (Turku Univ.) and J. Maeki (Turku Univ.) 1973 15 p refs
(ISBN-951-41-0159-6) Copyright. Avail: Issuing Activity

The twinning of the ordered alloy MgCd was studied by means of electron transmission and diffraction using slightly deformed polycrystalline samples. The twinning planes and the shear directions were found to be /101/ <10(-1)> and /111/ <(-5.67) (-1)6.67>. The models about the atom movements in /10(-1)2/ and /10(-1)1/ twins in the hexagonal structure were used to determine the shear directions. The validity of different models of atom movements was examined in the present case. The twin intersections in slightly deformed samples were observed to obey Cahn's continuity conditions. Author

N74-23313 Suomalainen Tiedeakatemia, Helsinki (Finland).
ELECTRON MICROSCOPIC INVESTIGATION OF THE TWO-PHASE REGION IN Mg3Cd
P. Pirttilae (Turku Univ.), K. Hanhi (Turku Univ.), P. Paalassalo (Turku Univ.), and J. Maeki (Turku Univ.) 1974 7 p refs
(ISBN-951-41-0169-3) Copyright. Avail: Issuing Activity

The two-phase region of an alloy close to the stoichometric composition Mg3Cd was investigated by means of electron microscopy. The mechanism of phase transformations apperas to be a general and continuous precipitation. As the result of the precipitation a lamellar structure was formed. When the precipitates cut off the matrix, their orientation became the same as that of the matrix. The boundary plane between the precipitates and the matrix is about (0001). Author

N74-23314+ Laboratoires d'Electronique et de Physique Appliquee, Paris Limeil-Brevannes (France).
PHYSICAL STUDY OF TELLURIUM BASE BINARY SEMICONDUCTING GLASSES Final Report [ETUDE PHYSIQUE DES VERRES SEMI-CONDUCTEURS BINAIRES A BASE DE TELLURE COMPTE RENDU DE FIN DE CONTRAT]
D. Rossier and J. Cornet Jul. 1973 64 p refs In FRENCH
(Contract DGRST-72-70-145-00-221-75-01)
Avail: NTIS HC $6.25

The study of physical, thermodynamic, and photoconductive properties of chalcogenide (Se and Te) binary glasses are presented. For the physico-chemical properties, a relationship was established between the phase diagram peculiarities for a binary alloy and the stability and crystallization of the corresponding vitreous phase. A strong correlation was observed between parameters describing the liquidus and vitreous phase. The aging of selenium evidenced the role of allotropic varieties in the vitreous phase stability. For photoconductivity, a dissociation mechanism of electron/hole pairs was evidenced (for energies lower than the gap) in relation to the existence of local fluctuations of the internal potential. For some preparation method, a surface recombination mechanism was found to occur due to Coulomb-centers. A strong correlation was found between the gap and the activation energy for photoconductivity in the bimolecular recombination regime. Other similar correlations were also found. ESRO

N74-23315+ Centre National d'Etudes des Telecommunications, Bagneux (France).
PROPERTIES OF MATERIALS PERFORMING IR TO VISIBLE LIGHT CONVERSION BY PHOTON ADDITION AND ENERGY TRANSFER Final Report [ETUDE DES SUBSTANCES PERMETTANT PAR ADDITION DE PHOTONS ET TRANSFERT D'ENERGIE LA CONVERSION D'UN RAYONNEMENT INFRA-ROUGE EN LUMIERE VISIBLE COMPTE RENDU DE FIN DE CONTRAT]
F. Auzel Aug. 1973 52 p refs In FRENCH
(Contract DGRST-72-7-0087)
Avail: NTIS HC $5.75

The preparation and properties of rare earth ions for IR/visible light conversion are presented. Various oxygenated matrices were prepared and the methodology is detailed. The ion most studied was Ho(+++), and the energy migration under laser irradiation is discussed. Preliminary results on excitation, absorption, and fluorescence spectra for other ions are given. A theoretical study of magnetic-magnetic energy transfers, applicable to but more general than the photon addition case, was performed. A bibliography on energy transfer with or without photon addition is given listing 160 references ranging from 1966 to 1972. Author (ESRO)

N74-23316+ Aix-Marseilles Univ. (France).
VISIBLE AND UV RECOMBINATION LIGHT EMITTED BY METALS AND ALLOYS UNDER ELECTRONIC BOMBARDMENT Final Report [ETUDE DANS LE VISIBLE ET L'ULTRA-VIOLET DELA LUMIERE DE RECOMBINAISON EMISE PAR LES METAUX ET LEURS ALLIAGES EXCITES PAR BOMBARDEMENT ELECTRONIQUE COMPTRE RENDU DE FIN DE CONTRAT]
Jean Hanus Jun. 1973 12 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-2792)
Avail: NTIS HC $4.00

The radiation emitted by thick metallic or alloy targets upon electronic bombardment between five and 25 keV was studied. Two special chambers were prepared for these experiments for in situ sample preparation in ultravacuum and surface properties control. An Auger spectroscopy instrumentation for surface contamination studies was available. Preliminary experimental results show that an important component of the emitted light is the transition radiation which is, however, often masked by the bremsstrahlung. The transition radiation appears very sensitive to surface contamination. Metals studied were Ag, Cu, Ni, and Au. ESRO

N74-23317+ Commissariat a l'Energie Atomique, Grenoble (France). Lab. Microelectronique.
MIIS STRUCTURE OPTIMIZATION FOR LONG LIFE INFORMATION STORAGE Final Report [OPTIMISATION DES STRUCTURES M.I.I.S. EN VUE DE LEUR UTILISATION DE L'INFORMATION COMPTE RENDU DE FIN DE CONTRAT]
V. LeGoascoz 14 May 1973 54 p refs In FRENCH
(Contract DGRST-71-7-2859)
Avail: NTIS HC $5.75

The implementation of memories for long life information storage using MIIS structures is presented. The properties of insulators and their electric behavior are detailed with regard to potential barriers and trapping centers especially in silicon nitride. The origin of parasitic phenomena was sought and traced down mainly to impurities in silicon dioxide and silicon nitride. The manufacturing technology is detailed with regard to optimization of the intrinsic properties of the insulating layer, the interfaces, and the thicknesses to be used with a view to specific applications. A memory system was built using the above technology. ESRO

N74-23318+ Compagnie Generale d'Electricite, Marcoussis (France).
STABILITY AND SUPRACONDUCTING CHARACTERISTICS OF RIBBON COMPOSITE CONDUCTORS IN A VARIABLE MAGNETIC FIELD Final Report [STABILITE ET CARACTERISTIQUES SUPRACONDUCTRICES DE CONDUCTEURS COMPOSITES EN RUBANS PLACES DANS UN CHAMP MAGNETIQUE VARIABLE]
J. C. Renard Jun. 1973 35 p refs In FRENCH
(Contract DGRST-72-7-0163)
Avail: NTIS HC $4.75

The theoretical and experimental study of short circuit influence between strips on the stability of superconducting Nb-Ti copper clad wires are presented. Theoretical results are expressed with regard to the loop characteristics and electrical and thermal conditions. The expressions found are different depending on the propagation or absence of propagation of the resistive zone appearing when the critical current is reached at some point of the loop. Short circuits can cause instabilities entailing a degradation of the critical current value. An original experimental rig was set up to study the current distribution between short circuited strands under field or current variation. The instability conditions was derived linking the maximum electric field allowable, and the critical current to a critical magnetic flux variation. A study of the stability of strips in a transverse magnetic field yielded an approximate theoretical stability criterion. ESRO

N74-23319+ Laboratoire Central des Industries Electriques (France).
MULTIFILAMENTARY MATERIALS LOSSES FOR DIAMETERS LESS THAN 10 MICROMETERS Final Report [ETUDES DES PERTES DANS LES MATERIAUX MULTIFILAMENTAIRES DONT LES DIAMETRES SONT INFERIEURS A 10 MICROMETRES]
G. Fournet, A. Mailfert, and T. Pech Jul. 1973 23 p In FRENCH
(Contract DGRST-72-7-0424)
(Rept-470; Etude-299-888) Avail: NTIS HC $4.25

The experimental determination of losses and resistive transitions of samples of composite superconductor wires of strand diameter less than 10 microns are presented. Losses were measured using the magnetization method. Results are discussed with regard to separation between intrinsic wire losses and matrix losses. A theoretical expression for the overall losses was quantitatively checked by measurement of the resistive transition curves. A theoretical approach to the problems associated with situations in which the distance between elementary strands is less than the conduction electrons mean free path in the matrix was formulated which requires non local electrodynamics and the use of the Boltzmann equation. ESRO

N74-23320+ Laboratoire Central des Industries Electriques (France).
VORTICES DYNAMICS IN RELATION TO THE METALLURGICAL STATE OF THE MATERIAL Final Report [ETUDE DE LA DYNAMIQUE DES VORTEX EN RELATION AVEC L'ETAT METALLURGIQUE DU MATERIAU]
J. Baixeras and G. Fournet Jun. 1973 15 p In FRENCH
(Contract DGRST-72-7-0422)
(Rept-464; Etude-299-887) Avail: NTIS HC $4.00

The existing relations between the metallurgic nature of defects in a type 2 superconductor and the vortex displacement mode was considered. A specific model was proposed to describe the hysteresis of resistive transitions, taking into account the sample thermal response. An experimental method to measure the noise spectra associated with vortex displacement was developed and applied to a hypersaturated solid solution of Pb-Sn in various stages of decomposition. Author (ESRO)

N74-23321+ Laboratoire Central des Industries Electriques (France).
TRIGGERING CONDITIONS AND DYNAMICS OF INSTABILITIES FOR THIN FIBER COMPOSITES (DIAMETERS LESS THAN 100 MICROMETERS) Final Report [CONDITIONS DE DECLENCHEMENT ET DYNAMIQUE DES INSTABILITES DANS LES COMPOSITES A FILAMENTS FINS (DIAMETRES INFERIEURS A 100 MICROMETRES) COMPTE RENDU DE FIN DE CONTRAT]
G. Fournet and A. Mailfert Jun. 1973 14 p refs In FRENCH
(Contract DGRST-72-7-0423)
(Rept-468; Etude-299-889) Avail: NTIS HC $4.00

The stability criteria for superconductors under various perturbations are presented. It is shown that the study of perturbation requires of necessity the study of the dynamics of instabilities. Various parameters having a bearing on the instability kinetics are reviewed and a general stability criterion is established for a specific set of thermal conditions and infinitesimal perturbations. The extension to other thermal conditions of this criterion is performed by means of dimensional analysis. Non-infinitesimal perturbations are taken into account. ESRO

N74-23322+ Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
VISIBLE (BLUE) LIGHT EMITTER PRODUCTION BY IR-VISIBLE CONVERSION USING PHOTON ADDITION AND ENERGY TRANSFER BETWEEN RARE EARTH IONS Final Report [REALISATION D'EMETTEURS DE LUMIERE VISIBLE PRINCIPALEMENT BLEUE, A PARTIR DE LA CONVERSION DE FREQUENCE INFRAROUGE-VISIBLE DANS DES ADDITIONNEURS DE PHOTONS PAR TRANSFERT D'ENERGIE (APTE) ENTRE IONS DE TERRES-RARES]
J. C. Reymond Jul. 1973 63 p refs In FRENCH
(Contract DGRST-72-7-0517)
Avail: NTIS HC $6.25

Visible light emitters constituted by an IR electroluminescent emitter and a multiphoton frequency converter are presented. The optimization of Ga-As IR emitters obtained by liquid amphoterons epitaxy is detailed with regard to deposit thickness, additives, sample preparation, effective power, and reproducibility. Simple converter structures are discussed with regard to converter materials, powder granulometry, and optical glues. The results of measurements in cc and impulse mode are discussed and yields are derived. Optical coupling tests were performed and needs for optimization in specific directions amenable to industrial procedures were evidenced. A comparison of multiphoton converter yields with existing semiconductor lasers is discussed. ESRO

N74-23323*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE EFFECT OF GRAIN BOUNDARIES ON THE RESISTIVITY OF POLYCRYSTALLINE SILICON Ph.D. Thesis - Va. Univ.
Archibald L. Fripp, Jr. May 1974 122 p refs
(NASA-TM-X-70076) Avail: NTIS HC $9.25 CSCL 20L

The electrical resistivity of polycrystalline silicon films was investigated. The films were grown by the chemical vapor decomposition of silane on oxidized silicon wafers. The resistivity was found to be independent of dopant atom concentration in the lightly doped regions but was a strong function of dopant levels in the more heavily doped regions. A model, based on high dopant atom segregation in the grain boundaries, is proposed to explain the results. Author

N74-23324*# Southern Univ., Baton Rouge, La. Dept. of Mechanical Engineering.
[BIDIRECTIONAL REFLECTANCE MEASUREMENT OF ZINC OXIDE IN 0.25 TO 2.5 MICRONS SPECTRUM] Final Report
Robert L. Scott, Jr. May 1974 132 p refs
(Grant NGR-19-005-009)
(NASA-CR-138449) Avail: NTIS HC $9.75 CSCL 20L

An experimental apparatus was designed and used to measure the bidirectional reflectance of zinc oxide in the spectrum 0.25 to 2.5 microns. The nonspecular reflectance is essentially Lambert for wavelengths above 0.40 microns with the most deviation occuring for large source zenith angles. Below 0.400 microns the nonspecular reflectance is greater than Lambert in all directions and is greatest in the forward and backscatter directions. The ratio of the specular component to the nonspecular component at a zenith of 0 degrees was found to increase with source zenith and wavelength for wavelengths above 0.400 microns. Below 0.400 microns this ratio increases as wavelengths decrease. The variation of bidirectional reflectance with wavelength was found to have the characteristics absorption for ZnO for wavelength below 0.400 microns. Author

N74-23325*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTRICAL RESISTIVITY OF SOME PALLADIUM-SILVER ALLOYS CONTAINING HYDROGEN AT 4.2 K
Robert J. Smith and Dumas A. Otterson Washington May 1974 12 p refs
(NASA-TN-D-7672; E-7725) Avail: NTIS HC $3.00 CSCL 11D

The electrical resistivities of the alloys 90at.%Pd - 10at.%Ag, 80at.%Pd - 20at.%Ag, 70at.%Pd - 30at.%Ag, 60at.%Pd - 40at.%Ag, and 50at.%Pd - 50at.%Ag were measured as functions of absorbed hydrogen x at 4.2 K. These results show a minimum in the resistivity for all the alloys except 90Pd-10Ag; they show a maximum for all the alloys except for 50Pd-Ag. We associate the shapes of the plots with a modification of the Pd D-band because of the substitutional alloying of Ag and the interstitial absorption of hydrogen. Author

N74-23326# National Research Council of Canada, Ottawa (Ontario). Translation Services.
ELECTRONIC STRUCTURE OF LIQUID Cu-Ge AND Au-Ga ALLOYS
H. J. Guentherodt and Y. Tieche 1974 6 p Transl. into ENGLISH from Helv. Phys. Acta (Basel), v. 41, no 6/7, 1968 p 855-857
(NRC-TT-1751) Avail: NTIS HC $4.00

The electrical resistivity of liquid Cu-Ge and Au-Ga alloys was measured as a function of temperature and concentration. Negative temperature coefficients and maxima centration range. The behaviour of the electrical resistivity can be explained with the help of the theory proposed by Faber and Ziman. Author

N74-23327# Institut Franco-Allemand de Recherches, St. Louis (France).
APPLICATION OF PHASE TRANSITIONS TO THE ELECTROMECHANICAL ENERGY CONVERSION [APPLICATION DES TRANSITIONS DE PHASE A LA CONVERSION MECANO-ELECTRIQUE DE L'ENERGIE]
F. Bauer and Y. Fetiveau (Lab. de Ferroelectricite, Lyon) 28 Sep. 1973 9 p refs In FRENCH
(ISL-CO-2/73) Avail: NTIS HC $4.00

The adiabatic depolarization of ferroelectric ceramics is discussed for direct energy release. The basic principles of the method are reviewed and theoretical calculations show that charge release should be performed in an extremely short time. Metastable materials are best adapted in view of the transition F/AF high mobility. A low electric conductivity at high pressure (25 kbar) and high remanent polarization are shown to be essential. Applications as high impulse current generators for electric detonators are outlined. ESRO

N74-23328# Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy and Materials Science.
MAGNETIC NEUTRON DIFFRACTION STUDIES OF PrCo5 AND SmCo5 Final Report
Kenneth R. Morash and Benjamin L. Averbach Nov. 1973 71 p refs
(Contract F33615-71-C-1323; AF Proj. 7367)
(AD-776020; AFML-TR-73-274) Avail: NTIS CSCL 20/12

The authors have examined PrCo5 powder samples by X-ray and neutron diffraction in order to determine the magnetic moments on the Pr and Co atoms. These data were analyzed assuming different spin orientation models. The only model which gave reasonable results was one of ferromagnetic coupling of the Pr and Co moments with the moment lying along the c-axis. The moments, in Bohr magnetons, calculated in this way, are listed in tables for various temperatures. A SmCo5 powder sample using a Sm154 isotope was also studied by neutron diffraction and with the vibrating sample magnetometer. (Modified author abstract) GRA

N74-23329# Missouri Univ., Rolla. Dept. of Physics.
DONOR IMPURITY SURFACE STATES IN SEMICONDUCTORS Final Report, 1 Jun. 1971 - 31 Dec. 1973
Edward B. Hale Feb. 1974 17 p refs
(Grant AF-AFOSR-2108-71)
(AD-776012; AFOSR-74-0349TR) Avail: NTIS CSCL 20/12

The goals of this research were to use ESR as a tool to elucidate on the nature and properties of donor surface states, and also to use ESR signals to determine details in semiconductor surface structure. Germanium doped with antimony was chosen as the most interesting donor-semiconductor system for study and a major effort was invested in this system. Another project involved ESR studies on the ion implanted surface layer in silicon. The purpose of this research was to investigate in detail the structural transformation from the crystalline to the amorphous state in the surface layer as a result of the ion implantation. GRA

N74-23330# Illinois Univ., Urbana. Coordinated Science Lab.
SUPERCONDUCTIVITY AT THE SURFACE OF LEAD TELLURIDE Ph.D. Thesis
David Lee Miller Sep. 1973 108 p refs
(Contract DAAB07-72-C-0259)
(AD-776144; R-620; UILU-ENG-73-2222) Avail: NTIS CSCL 20/12

Ultrathin films of the metals Pb, In, Tl, Sn, and Al were deposited on crystalline PbTe substrates in an attempt to fabricate a system favorable for the observation of an excitonic mechanism of superconductivity. For each of these metals, superconductivity was observed at the PbTe surface. A threshold amount of metal deposited was necessary for superconductivity, and the observed transition temperatures increased as the amount of metal deposited increased beyond the threshold amount. Maximum values of the observed T's at thicknesses less than 100A were 6.75K for In, about 5.25K for Tl, 7.15K for Pb, 3.4K for Sn, and 2.6K for Al. The PbTe substrate surface and the metal overgrowth were characterized by the use of low energy electron diffraction and Auger electron spectroscopy. (Modified author abstract) GRA

N74-23331# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
THE ANALYSIS OF OPTICAL SURFACE SCATTERING FROM EPITAXIAL FILMS Physical Sciences Research Papers
Richard N. Brown 28 Nov. 1973 11 p refs
(AF Proj. 5621)
(AD-775753; AFCRL-PSRP-577; AFCRL-TR-73-0728) Avail: NTIS CSCL 20/12

An expression has been derived for the transmission of infrared radiation through epitaxial films having a mat surface, which takes into account the scattering at the surface. This has been applied to the analysis of measurements of the fundamental absorption edge of epitaxial films of InAs. The results of this application include the evaluation of the intensity of the scattered light for several InAs films, and good agreement with published values of the absorption coefficient. Author (GRA)

N74-23332# Arizona Univ., Tucson. Optical Sciences Center.
MODULATION SPECTROSCOPY OF DISORDERED SOLIDS Semiannual Technical Report, 15 Jan. 1973 - 15 Jan. 1974
B. O. Seraphin and M. L. Kottke 15 Feb. 1974 75 p refs
(Grant DA-ARO(D)-31-124-73-G106)
(AD-775830; SATR-2) Avail: NTIS CSCL 20/12

The report presents results of the first half of a two-year study of the modulation spectra of disordered solids. The study is designed to explore the connection between the particular type of disorder in a given solid, and its optical spectra. GRA

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-23333*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TEST RESULTS FROM A BREADBOARD CRYOGENIC PROPELLANT CONDITION ASSEMBLY
Henry P. Stinson, Jr. Washington May 1974 32 p refs
(NASA-TN-D-7681; M-384) Avail: NTIS HC $3.25 CSCL 21I

Cryogenic auxiliary propulsion systems consist of five major subsystems: propellant tanks, propellant conditioning assemblies, accumulators, propellant distribution systems, and thrustors. The propellant conditioning assembly (PCA) converts low pressure liquid to high pressure gas for use by the thrustors, and is one of the most complex subsystems of the cryogenic propulsion system. The ability to achieve rapid starts and at the same time maintain system control are two critical areas of PCA operation. To investigate these critical areas of operation, a PCA of the general type required was designed, fabricated, and tested using existing hardware. Realistic start times were achieved and system control was maintained at all operating conditions. Author

N74-23334# National Aerospace Lab., Tokyo (Japan).
LOW-PRESSURE DEFLAGRATION LIMIT OF CONTROLLABLE SOLID ROCKET PROPELLANTS
Tomifumi Godai, Morio Shimizu, Katsuya Ito, Hisa Nishimura, Toshiharu Tanemura, and Tsutomu Fujiwara Oct. 1973 17 p refs In JAPANESE; ENGLISH summary
(NAL-TR-341) Avail: NTIS HC $4.00

The low pressure deflagration limit of controllable solid rocket propellants was experimentally investigated using low pressure combustion chambers and micro video recorders. The deflagration limit is affected by the specimen size, and this scale effect is explained by heat losses from the burning propellant to the surroundings. The effect of compositional variables of the propellant on subatmospheric combustion and the deflagration limit were studied. The variables were oxidizer blend ratio, binder types, oxidizer-fuel mixture ratio, aluminum content, mean particle diameter of the oxidizers and the size of aluminum powders. Author

N74-23335# Hermann Oberth-Gesellschaft, Gesellschaft zur Foerderung der Erforschung und Erschliessung des Weltraums e. V., Hannover (West Germany).
CHEMISTRY OF SOLID PROPELLANTS [ZUR CHEMIE DER FESTTREIBSTOFFE]
Eberhard Buechner (Tech. Univ. Munich) 1973 12 p In GERMAN
(Astronaut-FB-31) Avail: NTIS HC $4.00

Formulae, applications, methods of preparation, physical and chemical data, storability, and rheological data of 82 solid propellants are given in tabular form. The review is an annex to Astronautischen Forschungsbericht nr.28(1967) of Hermann-Oberth Gesellschaft e.V., Bremen, Germany, entitled 'Physikalische Daten einiger flussiger Brennstoffe und Oxydatoren' (Physical Data of Some Liquid Fuels and Oxidators). ESRO

N74-23336# European Space Research Organization, Paris (France).
FULL-SCALE EXPERIMENTAL INVESTIGATION OF MAIN TANK INJECTION FOR UDME/N2O4,UDMH/WFNA AND UDMH/RFNA SYSTEMS
M. Koenig Mar. 1974 107 p refs Transl. into ENGLISH of Exptl. Untersuch. zur Druckgaserzeugung durch Direkteinspritzung im Grossmassstab fuer die Systeme UDMH/N2O4, UDMH/WFNA und UDMH/RFNA, DLR-FB-73-65, DFVLR, 17 Apr. 1973
(ESRO-TT-30; DLR-FB-73-65) Avail: NTIS HC $8.50; DFVLR, Porz, West Ger. 38 DM

The practicality of pressurization by means of main tank injection was demonstrated in 98 tests. UDMH was injected into a 2.26 cum oxidizer tank providing tank pressures up to 30 bars with flow rates as high as 50 kg/s. Solid-stream surface injection technique was selected. Pressure regulation was achieved by pulsing the injected stream or by pressurizing the UDMH tank and allowing the Del P between the tanks to cause self-regulation of the stream. The pressure behavior was acceptable for tank depths up to 3 meters. Gas temperatures reached 1600 C while the maximum wall temperature was 120 C. The ratio of injected UDMH to expelled oxidizer was approximately 0.0015. No important differences were noticed for the three oxidizers. Author (ESRO)

N74-23337# Bureau of Mines, Amarillo, Tex. Branch of Helium Resources.
ANALYSES OF NATURAL GASES, 1972
L. E. Cardwell and L. F. Benton Nov. 1973 109 p refs
(PB-225977/8; BM-IC-8607) Avail: NTIS MF $1.45; SOD HC $1.25 CSCL 21D

This publication contains routine analyses and related source data for 299 natural gas samples from 22 states and three foreign countries. All samples were collected during Calendar Year 1972 as a part of a continuous survey of the free world for occurrences of helium. GRA

N74-23338# Ballistic Research Labs., Aberdeen Proving Ground, Md.
SOLID PROPELLANT FLAMMABILITY INCLUDING IGNITABILITY AND COMBUSTION LIMITS
L. H. Caveny (Princeton Univ.), M. Summerfield (Princeton Univ.), R. C. Strittmater, and A. W. Barrows Mar. 1974 35 p refs
(DA Proj. 1J6-62604-AH-97)
(AD-775795; BRL-1701) Avail: NTIS CSCL 21/9

Studies were directed at developing an understanding of mechanisms of propellants burning in air and of factors that control limits of burning so that one may rationalize choices of propellant formulation, charge configuration, process techniques, and special additives to reduce accidental ignition and burning of propellants in ambient air. Propellants were categorized in terms of convective, conductive, and radiative ignition data and in terms of burning rate and extinguishment limit data. Significant improvements in the flammability limits have been achieved using coolants (at the 10% level) with composite propellants made from high decomposition-temperature ingredients (e.g., HMX and polyurethane). (Modified author abstract) GRA

N74-23339# Utah Univ., Salt Lake City. Dept. of Chemical Engineering.
EXTINGUISHMENT OF COMPOSITE PROPELLANTS AT LOW PRESSURES
Chung Poo Park, Norman W. Ryan, and Alva D. Baer 10 Dec. 1973 346 p refs
(Grant AF-AFOSR-1656-69; AF Proj. 9711)
(AD-776000; AFOSR-74-0361TR) Avail: NTIS CSCL 21/9

Propellants containing ammonium perchlorate and several commonly used polymer fuels were extinguished at low pressures. The extinguishment pressures were found to be strongly affected by the thermal environment, being lower when external flux compensated for heat loss. With a fixed thermal environment and extinguishment during depressurization, it was found that at very low depressurization rates, the extinguishment pressure depends on the rate in a manner suggesting energy starvation at the zone of first reactions. At the very low pressures, extinguishment appears to be caused by an intrinsic combustion instability featuring out-of-phase oscillations in the gasification rates of oxidant and polymer. GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-23340*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GASEOUS EXHAUST EMISSIONS FROM A J-58 ENGINE AT SIMULATED SUPERSONIC FLIGHT CONDITIONS
James D. Holdeman Apr. 1974 23 p refs
(NASA-TM-X-71532; E-7935) Avail: NTIS HC $4.25 CSCL 21E

Emissions of total oxides of nitrogen, unburned hydrocarbons, carbon monoxide, and carbon dioxide from a J-58 engine at simulated flight conditions of Mach 2.0, 2.4, and 2.8 at 19.8 km altitude are reported. For each flight condition, measurements were made for four engine power levels from maximum power without afterburning through maximum afterburning. These measurements were made 7 cm downstream of the engine primary nozzle using a single point traversing gas sample probe. Results show that emissions vary with flight speed, engine power level, and with radial position across the exhaust. Author

N74-23341*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FOD IMPACT TESTING OF COMPOSITE FAN BLADES
R. H. Johns Apr. 1974 24 p refs Presented at 19th Natl. SAMPE Symp. and Exhibition, Buena Park, Calif., 23-25 Apr. 1974
(NASA-TM-X-71544) Avail: NTIS HC $4.25 CSCL 21E

The results of impact tests on large, fiber composite fan blades for aircraft turbofan engine applications are discussed. Solid composite blades of two different sizes and designs were tested. Both graphite/epoxy and boron/epoxy were evaluated. In addition, a spar-shell blade design was tested that had a boron/epoxy shell bonded to a titanium spar. All blades were tested one at a time in a rotating arm rig to simulate engine operating conditions. Impacting media included small gravel, two inch diameter ice balls, gelatin and RTV foam-simulated birds, as well as starlings and pigeons. The results showed little difference in performance between the graphite and boron/epoxy blades. The results also indicate that composite blades may be able to tolerate ice ball and small bird impacts but need improvement to tolerate birds in the small duck and larger category. Author

N74-23342*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REDUCTION OF JT8D POWERED AIRCRAFT NOISE BY ENGINE REFANNING
L. E. Stitt and A. A. Medeiros 1974 26 p refs Presented at the Air Transport Meeting, Dallas, 30 Apr. - 2 May 1974, sponsored by SAE
(NASA-TM-X-71536; E-7942) Avail: NTIS HC $4.50 CSCL 21E

The technical feasibility is described of substantially reducing the noise levels of existing JT8D powered aircraft by retrofitting the existing fleet with quieter refan engines and new acoustically treated nacelles. No major technical problems exist that preclude the development and installation of refanned engines on aircraft currently powered by the JT8D engine. The refan concept is technically feasible and provides calculated noise reductions of from 7 to 8 EPNdb for the B727-200 aircraft and from 10 to 12 EPNdb for the DC-9-32 aircraft at the FAR Part 36 measuring stations. These noise levels are lower than both the FAR Part 36 noise standards and the noise levels of the wide-body DC-10-10. Corresponding reductions in the 90 EPNdb footprint area are estimated to vary from about 70 percent for the DC-9 to about 80 percent for the B727. Author

N74-23343*# Rocketdyne, Canoga Park, Calif.
ROTATING AND POSITIVE-DISPLACEMENT PUMPS FOR LOW-THRUST ROCKET ENGINES. VOLUME 1: PUMP EVALUATION AND DESIGN Final Report
C. MacGregor and A. Csomor Feb. 1974 227 p refs 2 Vol.
(Contract NAS3-12022)
(NASA-CR-72965; R-8494-1-Vol-1) Avail: NTIS HC $14.50 CSCL 21H

Rotating and positive displacement pumps of various types were studied for pumping liquid fluorine for low-thrust, high-performance rocket engines. Included in the analysis were: centrifugal, pitot, Barske, Tesla, drag, gear, vane, axial piston, radial piston, diaphragm, and helirotor pump concepts. The centrifugal pump and the gear pump were selected and these were carried through detailed design and fabrication. Mechanical difficulties were encountered with the gear pump during the preliminary tests in Freon-12. Further testing and development was therefore limited to the centrifugal pump. Tests on the centrifugal pump were conducted in Freon-12 to determine the hydrodynamic performance and in liquid fluorine to demonstrate chemical compatibility. Author

N74-23344*# Rocketdyne, Canoga Park, Calif.
ROTATING AND POSITIVE-DISPLACEMENT PUMPS FOR LOW-THRUST ROCKET ENGINES. VOLUME 2: FABRICATION AND TESTING Final Report
A. Csomor Feb. 1974 146 p refs
(Contract NAS3-12022)
(NASA-CR-72966; R-8494-2-Vol-2) Avail: NTIS HC $10.50 CSCL 21H

Rotating and positive displacement pumps of various types were studied for pumping liquid fluorine for low thrust high performance rocket engines. Included in the analysis were: centrifugal, pitot, Barske, Tesla, drag, gear, vane, axial piston, radial piston, diaphragm and helirotor pump concepts. The centrifugal and gear pumps were carried through detail design and fabrication. After preliminary testing in Freon 12, the centrifugal pump was selected for further testing and development. It was tested in Freon 12 to obtain the hydrodynamic performance. Tests were also conducted in liquid fluorine to demonstrate chemical compatibility. Author

N74-23345# General Environments Corp., Springfield, Va.
A STUDY OF EMISSIONS FROM 1966-1972 LIGHT DUTY VEHICLES IN WASHINGTON, D. C., SECOND EDITION Final Report
A. R. Martin and R. A. Herrick Jan. 1974 104 p
(Contract EPA-68-01-0454)
(APTD-1506) Avail: NTIS HC $8.25 CSCL 21A

Research data are reported on 170 privately owned passenger vehicles from the Metropolitan Washington, D. C. area, which were tested for exhaust emission levels of carbon monoxide, carbon dioxide, hydrocarbons, and oxides of nitrogen according to the 1975 Federal test procedure. Testing of vehicles included both cold and hot start cycles. The results were then used to calculate emission factors based on both the 1972 and 1975 Federal test procedures. Author

N74-23346# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
FLUTTER OF CASCADING BLADE ROW. REPORT 2: EXPERIMENT ON AERODYNAMIC DAMPING OF CASCADING CIRCULAR-ARC BLADE ROW
Yoji Hanamura Dec. 1973 18 p refs
(ISAS-503-Vol-38-No-14) Avail: NTIS HC $4.00

The experimental data on the aerodynamic forces and moments during blade vibration of torsion mode are arranged in case where the torsion axis of vibration situates at blade nose and tail. The experiments were carried on varying the stagger angle using the cascade of unit solidity with circular-arc blades in the incompressible fluid. Comparisons of theory and experiment of various cascade condition, show in which case, turbine or compresser, nose support or tail support, are most reasonable. Theory is constructed on the bases of so called Kutta's condition at blade tail. Author

N74-23347*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TWO-DIMENSIONAL COLD-AIR CASCADE STUDY OF A FILM-COOLED TURBINE STATOR BLADE. 1: EXPERIMENTAL RESULTS OF PRESSURE-SURFACE FILM COOLING TESTS
Thomas P. Moffitt, Herman W. Prust, Jr., and Wayne M. Bartlett Washington May 1974 32 p refs
(NASA-TM-X-3045; E-7817) Avail: NTIS HC $3.25 CSCL 21E

The effect of film coolant ejection from the pressure side of a stator blade was determined in a two-dimensional cascade. Stator exit surveys were made for each of six rows of coolant holes. Successive multirow tests were made with two, three, four, five, and six rows of coolant holes open. The results of the multirow tests are compared with the predicted multirow performance obtained by adding the single-row data. Results are presented in terms of stator primary-air efficiency as a function of coolant fraction. Author

N74-23348*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELECTRIC ARC DISCHARGE DAMAGE TO ION THRUSTER GRIDS
Dale D. Beebe, Shigeo Nakanishi, and Robert C. Finke Washington May 1974 37 p refs

(NASA-TM-X-3044; E-7767) Avail: NTIS HC $3.25 CSCL 21E

Arcs representative of those occurring between the grids of a mercury ion thruster were simulated. Parameters affecting an arc and the resulting damage were studied. The parameters investigated were arc energy, arc duration, and grid geometry. Arc attenuation techniques were also investigated. Potentially serious damage occurred at all energy levels representative of actual thruster operating conditions. Of the grids tested, the lowest open-area configuration sustained the least damage for given conditions. At a fixed energy level a long duration discharge caused greater damage than a short discharge. Attenuation of arc current using various impedances proved to be effective in reducing arc damage. Faults were also deliberately caused using chips of sputtered materials formed during the operation of an actual thruster. These faults were cleared with no serious grid damage resulting using the principles and methods developed in this study. Author

N74-23349*# Boeing Commercial Airplane Co., Seattle, Wash.
PROGRAM ON GROUND TEST OF MODIFIED QUIET, CLEAN, JT3D AND JT8D TURBOFAN ENGINES IN THEIR RESPECTIVE NACELLES Final Report
Sep. 1973 280 p ref
(Contract NAS3-16815)
(NASA-CR-134553; D6-41244) Avail: NTIS HC $17.00 CSCL 21E

A program to reduce the community noise levels of commercial jet aircraft is summarized. The program objective is the development of three acoustically treated nacelle configurations for the 707, 727, and 737 series aircraft to provide maximum noise reduction with minimum performance loss, modification requirements, and economic impact. The preliminary design, model testing, data analyses, and economic studies of proposed nacelle configurations are discussed. Author

N74-23350*# Colorado State Univ., Fort Collins. Dept. of Physics.
THEORETICAL INVESTIGATIONS ON PLASMA PROCESSES IN THE KAUFMAN THRUSTER Annual Report
H. E. Wilhelm 1 Jun. 1973 94 p refs
(Grant NGR-06-002-147)
(NASA-CR-134637) Avail: NTIS HC $7.75 CSCL 21C

The lateral neutralization of ion beams is treated by standard mathematical methods for first order, nonlinear partial differential equations. A closed form analytical solution is derived for the transient lateral beam neutralization for electron injection by means of a von Mises transformation. A nonlinear theory of the longitudinal ion beam neutralization is developed using the von Mises transformation. By means of the Lenard-Balescu equation, the intercomponent momentum transfer between stable, collisionless electron and ion components is calculated. F.O.S.

N74-23351# Aerojet Solid Propulsion Co., Sacramento, Calif.
THE SELECTION AND DEMONSTRATION OF ADVANCED NONDESTRUCTIVE TESTING TECHNIQUES FOR ON-SITE MISSILE INSPECTION. VOLUME 2: APPENDICES Final Report, 15 May 1972 - 14 Sep. 1973
Herman P. Briar, Kenneth W. Bills, Jr., Robert W. Cribbs (Electra-Phys. Co., Folsom, Calif.), and Billy L. Lamb (Electra-Phys. Co., Folsom, Calif.) Nov. 1973 161 p refs
(Contract F04611-72-C-0071)
(AD-774905; ASPC-1963-26F-Vol-2; AFRPL-TR-73-91-Vol-2) Avail: NTIS CSCL 21/9

The report describes a program planned around the problem of on-site non-destructive testing (NDT) of solid rocket motors. It was designed to select, evaluate, and demonstrate NDT capabilities, beginning with comprehensive surveys of industry and the world's literature (from 1960 to mid-1972). Only two techniques showed promise: Ultrasonic holography and gamma radiography. In the ensuing developments ASPC evaluated two ultrasonic systems. The first, modified ultrasonic holography, was developed from known principals of holography and ultrasound transmission through materials. The theoretical resolution of this system ranges between 0.4 in. and 1 in. at a depth of 18 in. into the propellant. The second system, acoustic profilography, uses the principal of diffraction to measure the shortest path across a secant of the motor. (Modified author abstract) GRA

N74-23352# Bendix Corp., Utica, N.Y. Fluid Power Div.
PRODUCT SUPPORT PROGRAM: AIR TURBINE STARTERS AIR CONTROL VALVES
W. E. Coman and R. A. Charlebois Jan. 1974 141 p refs
(Contract N00019-73-C-0148)
(AD-776264; Rept-8720-1571) Avail: NTIS CSCL 21/5

The object of the program was to conduct a product support program on Bendix Air Turbine Starters and Air Control Valves to increase their reliability and service life. GRA

N74-23514 European Space Research Organization, Paris (France).
CONDITIONS OF ROTATING STALL SUPPRESSION IN AXIAL COMPRESSORS
Yves LeBot (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 16-32 refs
Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 63-69 (For availability see N74-23512 14-34)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-23353 Wisconsin Univ., Madison.
ION ABUNDANCES IN THE SOLAR WIND Ph.D. Thesis
James Joseph Lange 1973 252 p
Avail: Univ. Microfilms Order No. 73-30328

The model of the solar wind used to interpret the Vela data and various additional processes and sources of ions in the solar corona and solar wind was investigated, and the difficulties in interpreting the data are illusttated. These include both the high temperature of the Vela energy-to-charge spectra and maintains the ions in the solar wind in highly charged states, and the inherent ambiguity in positively identifying these ions with only a mass-to-charge spectrum. With reasonable models of the elemental abundances and ionization structure in the solar corona and solar wind, alternative interpretations of the Vela data are presented. Dissert. Abstr.

N74-23354 Cornell Univ., New York.
THE SOLAR WIND, THE INTERSTELLAR MEDIUM AND JUPITER Ph.D. Thesis
Thomas Redmond McDonough 1973 253 p
Avail: Univ. Microfilms Order No. 74-6329

The raisin-pudding interstellar-medium model of Hjellming, Gordon, and Gordon is revised to include possible pressure differences between the cloud and the intercloud medium. It is shown that limits may be placed on the range of densities, pressures, and ionization rates allowed by the theory. We use the theory to interpret the data on the Crab nebula, allowing for its probable intrinsic dispersion measure, and show that, if the theory is applicable, it is unlikely that the plasma, gas, and magnetic pressures of the medium total much more than the pressure of a 4 x times 10 the minus 6th power gauss magnetic field. Pulsar dispersion and Faraday rotation are shown to be principally due to the intercloud portion of the medium, rather than the clouds. The interaction of the solar wind with the interstellar medium is also studied. It has previously been suggested that the solar wind might terminate at distances of 5 AU to 20 AU from the sun, and that the solar wind might be drastically slowed down by charge exchange and photoionization of interstellar hydrogen atoms which approach the sun. Dissert. Abstr.

N74-23355*# Franklin Inst., Swarthmore, Pa. Bartol Research Foundation.
MAGNETIC FIELDS IN THE SUN
D. J. Mullan [1974] 46 p refs Presented at 50th Ann. Symp. of BRF, Swarthmore, Pa., 10-11 May 1974 (expanded

version) Submitted for publication
(Grant NGR-39-005-066)
(NASA-CR-138189) Avail: NTIS HC $5.50 CSCL 03B

The observed properties of solar magnetic fields are reviewed, with particular reference to the complexities imposed on the field by motions of the highly conducting gas. Turbulent interactions between gas and field lead to heating or cooling of the gas according to whether the field energy density is less or greater than the maximum kinetic energy density in the convection zone. The field strength above which cooling sets in is 700 gauss. A weak solar dipole field may be primeval, but dynamo action is also important in generating new flux. The dynamo is probably not confined to the convection zone, but extends throughout most of the volume of the sun. Planetary tides appear to play a role in driving the dynamo. Author

N74-23356*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MIRRORING WITHIN THE FOKKER-PLANCK FORMULATION OF COSMIC RAY PITCH ANGLE SCATTERING IN HOMOGENEOUS MAGNETIC TURBULENCE
M. L. Goldstein, A. J. Klimas, and G. Sandri (Aeronautical Res. Assoc. of Princeton, Inc.) May 1974 39 p refs Submitted for Publication
(NASA-TM-X-70645; X-692-74-117) Avail: NTIS HC $5.00 CSCL 03B

The Fokker-Planck coefficient for pitch angle scattering, appropriate for cosmic rays in homogeneous, stationary, magnetic turbulence, is computed from first principles. No assumptions are made concerning any special statistical symmetries the random field may have. This result can be used to compute the parallel diffusion coefficient for high energy cosmic rays moving in strong turbulence, or low energy cosmic rays moving in weak turbulence. Becuase of the generality of the magnetic turbulence which is allowed in this calculation, special interplanetary magnetic field features such as discontinuities, or particular wave modes, can be included rigorously. The reduction of this results to previously available expressions for the pitch angle scattering coefficient in random field models with special symmetries is discussed. The general existance of a Dirac delta function in the pitch angle scattering coefficient is demonstrated. It is proved that this delta function is the Fokker-Planck prediction for pitch angle scattering due to mirroring in the magnetic field. Author

N74-23357# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
MEASUREMENTS OF COSMIC-RAY IONIZATION FROM SEA-LEVEL AT 25 km ALTITUDE
Takao Iida, Yukimasa Ikebe, Yoshiyuki Nakashima, and Minoru Kawano Mar. 1974 9 p refs
(ISAS-507-Vol-39-No-4) Avail: NTIS HC $4.00

In the autumns of 1967, 1968, 1969, and 1970, four balloon flights were made at low latitudes, from Taiyo (mag. lat. 26 deg N) and Haranomachi (mag. lat. 28 deg N), Japan. Vertical profiles of the ionization intensity due to cosmic rays were obtained with spherical chambers carried by the balloons. The maximum ionization intensity was about 110J at an altitude of 17 km. The observed ionization intensities showed a decrease of about 10 percent as compared with that deduced from the data obtained in 1965, which is ascribed to the 11 years solar cycle. Author

N74-23358# National Physical Lab., New Delhi (India). Radio Propagation Unit.
SOLAR AND GEOPHYSICAL DATA, PART 2
Nov. 1973 9 p refs
(RRC-A221-Pt-2; SG-94) Avail: NTIS HC $4.00

Predicted and observed solar and geophysical data are presented in tables and graphs. The data include sunspot numbers, solar flux, solar flares and their effects, magnetic storms, and SID effects. Author

N74-23359# National Physical Lab., New Delhi (India).
SOLAR AND GEOPHYSICAL DATA, PART 2
Dec. 1973 12 p
(RRC-A222-Pt-2) Avail: NTIS HC $4.00

For abstract, see N74-23358.

N74-23360# National Physical Lab., New Delhi (India). Radio Propagation Unit.
SOLAR AND GEOPHYSICAL DATA, PART 2
Jan. 1974 8 p refs
(RRC-A223-Pt-2; SG-96) Avail: NTIS HC $4.00

For abstract, see N74-23358.

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-23361 Florida Univ., Gainesville.
PHOTOELECTRIC INVESTIGATIONS OF AA CETI AND UZ PUPPIS Ph.D. Thesis
Raymond Howard Bloomer, Jr. 1973 189 p
Avail: Univ. Microfilms Order No. 74-9534

Two eclipsing binary stars were observed photoelectrically using thirty-inch reflecting telescope at the Rosemary Hill Observatory. The entire light variation of each star was measured in three colors, and a total of over 1,400 useful observations were made. A period study was undertaken for each star, and solutions of the light curves were found based upon the Russell-Merrill model. The star, AA Ceti, was found to be a variable in a routine search of sky patrol plates. It is the brighter component of the visual binary Aitken 1581. Although UZ Puppis had been studied spectroscopically and photometrically by photographic methods, no reports of photoelectric light curves were found in the Florida Card Catalogue of Eclipsing Binary Stars. The star was observed photoelectrically on thirteen nights. A period study did not reveal a significant change in the period from previously published values. Dissert. Abstr.

N74-23362 Michigan Univ., Ann Arbor.
FeI FLUORESCENCE WITH ASTROPHYSICAL APPLICATIONS Ph.D. Thesis
Lee Ann Mordy Willson 1973 46 p
Avail: Univ. Microfilms Order No. 74-3750

A statistics equilibrium analysis for the selective excitation of lambda lambda 4063, 4132 of FeI by CaII H shows: (1) selective excitation by CaII can reproduce the line intensities observed in Tau Tauri stars; (2) when enhanced lambda lambda 4063, 4132 emission is observed, an upper limit on the electron density as a function of distance from the star is obtained; and (3) it is sometimes also possible to obtain an upper limit on the electron temperature and a lower limit on the electron density. Limits obtained for RW Aurigae are: N sub e/W < or = 10 to the 16th power for Tau sub e=3000 K. N sub e is too high unless W < or = 10 to the minus 8th power; thus N sub e < or = 10 to the 8th power and the emission comes from 10,000 to 1,000,000 stellar radii out from the star. A probable characteristic of Tau Tauri stars is thus an extremely extended envelope. Dissert. Abstr.

N74-23363 Cornell Univ., New York.
PULSAR RADIOFREQUENCY OBSERVATIONS WITH A DIGITAL PULSAR PROCESSOR Ph.D. Thesis
Valentin Boriakoff 1973 308 p
Avail: Univ. Microfilms Order No. 74-7174

Pulsar radiofrequency observations are hampered by the variable pulsar pulse delay with frequency caused by the interstellar plasma. This means that an increase in the signal-to-noise ratio by increasing the receiver single channel bandwidth can be done only at the expense of smearing the pulse shape by differential delay within the bandwidth. A device (digital pulsar processor) was designed and put in operation to overcome this difficulty. It operates in three main modes: post-detection-dedispersion, pre-detection-dedispersion, and spectrometer mode. Three types of observations were carried out: low level radiation from pulsars outside the known emission ranges, in particular a search for an interpulse; spectral observation of interstellar scintillation in pulsar emission; and observation of the microstructure of CP0950+08 and AP2016+28. Dissert. Abstr.

N74-23364*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
APOLLO 15 RAKE SAMPLE MICROBRECCIAS AND NON-MARE ROCKS: BULK ROCK, MINERAL AND GLASS ELECTRON MICROPROBE ANALYSES Special Publication No. 11
Paul F. Hlava, Jonathan A. Green, Martin Prinz, C. E. Nehru (City Univ. of New York), Klaus Keil, Eric Dowty, and T. E. Bunch [1972] 80 p refs Prepared in cooperation with N. Mex. Univ., Albuquerque
(Grant NGL-32-004-063)
(NASA-TM-X-70079) Avail: NTIS HC $7.00 CSCL 03B

Quantitative electron microprobe data of Apollo 15 nonmare rake samples are presented. Bulk analyses of lithic fragments in the nomare rocks (expressed in oxide weight-percent) and the corresponding CIPW molecular norms are given. The mineralogy of the rocks and lithic fragments are also given; structural formulae for complete analyses and molecular end-members for all mineral analyses are included. The mineral analyses include pyroxene, olivine, plagioclase, barian K-feldspar, spinel and ilmenite, cobaltian metallic nickel-iron as well as SiO2-K2O-rich residual glass. Electron micropobe analyses (oxide weight percent) of glasses in loose fines and microbreccia samples and their CIPW molecular norms are presented along with electron microprobe data on bulk, mineral, and matrix glass from chondrules. Author

N74-23365*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
STELLAR WINDS DRIVEN BY ALFVEN WAVES
John W. Belcher and Stanislaw Olbert Oct. 1973 85 p refs
(Grant NGL-22-009-372)
(NASA-CR-138244; CSR-TR-73-5) Avail: NTIS HC $7.25 CSCL 03B

Models of stellar winds were considered in which the dynamic expansion of a corona is driven by Alfven waves propagating outward along radial magnetic field lines. In the presence of Alfven waves, a coronal expansion can exist for a broad range of reference conditions which would, in the absence of waves, lead to static configurations. Wind models in which the acceleration mechanism is due to Alfven waves alone and exhibit lower mass fluxes and higher energies per particle are compared to wind models in which the acceleration is due to thermal processes. For example, winds driven by Alfven waves exhibit streaming velocities at infinity which may vary between the escape velocity at the coronal base and the geometrical mean of the escape velocity and the speed of light. Upper and lower limits were derived for the allowed energy fluxes and mass fluxes associated with these winds. Author

N74-23366*# Science Applications Inc., Schiller Park, Ill.
PIONEER MARS 1979 MISSION OPTIONS Technical Report, Nov. 1973 - Jan. 1974
A. L. Friedlander, W. K. Hartmann, and J. C. Niehoff 29 Jan. 1974 103 p refs
(Contract NASw-2494)
(NASA-CR-138393; SAI-120-M1) Avail: NTIS HC $8.25 CSCL 22A

A preliminary investigation of lower cost Mars missions which perform useful exploration objectives after the Viking/75 mission was conducted. As a study guideline, it was assumed that significant cost savings would be realized by utilizing Pioneer hardware currently being developed for a pair of 1978 Venus missions. This in turn led to the additional constraint of a 1979 launch with the Atlas/Centaur launch vehicle which has been designated for the Pioneer Venus missions. Two concepts, using an orbiter bus platform, were identified which have both good science potential and mission simplicity indicative of lower cost. These are: (1) an aeronomy/geology orbiter, and (2) a remote sensing orbiter with a number of deployable surface penetrometers. Author

N74-23367*# Techtran Corp., Silver Spring, Md.
CERTAIN ASPECTS OF PLANETARY JOINTING AND RELATED PHENOMENA
S. S. Shults Washington NASA Aug. 1973 15 p ref Transl. into ENGLISH from Vestn. Leningard. Univ., Geol., Geogr. (USSR), no. 1, 1969 p 86-99
(Contract NASw-2485)
(NASA-TT-F-14746) Avail: NTIS HC $4.00 CSCL 03B

Planetary jointing is defined as endokinetic joints whose dimensional orientation is not related to local features, but to general planetary ones. The vector diagrams of jointing for vast, separate, and geologically different areas of the Russian platform were constructed in the laboratory. The orientation of joint systems in these diagrams corresponds to the theoretical planetary stress network depending on rotational forces at the present position of the earth's poles. The diagrams for limited regions differ greatly. The correlation of these diagrams with the age and composition of the rocks, geological structure and location is noted. Author

N74-23368*# Kanner (Leo) Associates, Redwood City, Calif.
INSTRUMENTS FOR THE ASTROPHYSICAL INVESTIGATIONS OF MARS
V. I. Moroz, L. V. Ksanformalit et al Washington NASA May 1974 36 p Transl. into ENGLISH of "Pribory Dlya Astrofizicheskikh Issledovaniy Marsa" Moscow, Acad. of Sci., 1974 34 p
(Contract NASw-2481)
(NASA-TT-F-15623) Avail: NTIS HC $5.00 CSCL 03B

Brief descriptions are presented of a number of devices installed on an artifical satellite of Mars. These include a narrow band infrared photometer for determination of the H2O content in the atmosphere of Mars, an infrared radiometer, a photometer for measurement of the distribution of brightness over the planet, an infrared photometer for the CO2 absorption band, a photometer polarimeter, an infrared spectrophotometer, a two channel ultraviolet photometer, a plasma particle spectrometer, devices for study of the solar wind and the plasma near the planet, a magnetometer, a gamma spectrometer, a radiometer and an ultraviolet photometer. Apparata installed on the descent module are also discussed, including a temperature and pressure meter and a mass spectrometer. Author

N74-23369*# Techtran Corp., Glen Burnie, Md.
MEASUREMENTS OF LOW ENERGY PARTICLES BY THE MARS-2 AND MARS-3 PLANETARY PROBES
M. R. Aynbund, A. V. Bogdanov, O. L. Vaysberg, Ye. M. Vasilyev, L. S. Zhurina, A. A. Zertsalov, I. P. Karpinskiy, V. G. Kovalenko, B. V. Polenov, and V. I. Subrotin Washington NASA May 1974 10 p refs Transl. into ENGLISH from Kosmich. Issled. (Moscow), v. 11, no. 5, Sep.-Oct. 1973 p 738-742
(Contract NASw-2485)
(NASA-TT-F-15539) Avail: NTIS HC $4.00 CSCL 03B

An instrument is described which measures electrons and ions in the 0.03 to 10 keV energy range. Two such instruments were installed in the Mars-2 and Mars-3 planetary probes. With the device, based on the principle of an electrostatic analyzer with a detector, energy spectra are measured by sequential volt switching through the analyzer channels, each of the 8 channels performing in its energy range. These instruments operate in three modes differing in frequency and number of measurements. In one of the modes, with the instruments operating continuously and taking spectra every two minutes, it was possible to determine the topography and boundaries of the interaction zone between the solar wind and Mars with high accuracy. Author

N74-23370*# Techtran Corp., Glen Burnie, Md.
PORTRAIT OF THE PLANET MARS
V. Moroz Washington NASA May 1974 8 p Transl. into ENGLISH from Izv. (Moscow), 28 Mar. 1974 p 5, col. 1-3
(Contract NASw-2485)
(NASA-TT-F-15578) Avail: NTIS HC $4.00 CSCL 03B

The properties of Mars as determined by the Soviet and American space probes are reviewed. General information is presented on the surface characteristics, the composition of the atmosphere, the nature of the surface, and the question of the magnetic field in the vicinity of Mars. Brief mention is made of the instruments employed by the probes in study of the planet. Author

N74-23371*# Colorado Univ., Boulder. Dept. of Astro-Geophysics.
ANALYSIS OF IMP-C DATA FROM THE MAGNETOSPHERIC TAIL Final Technical Report, 1 Nov. 1968 - 31 May 1973
T. W. Speiser 31 May 1973 53 p refs

(Grant NGR-06-003-092)
(NASA-CR-138192) Avail: NTIS HC $5.75 CSCL 03B

Satellite magnetic field measurements in the geomagnetic tail current sheet are analyzed to determine the normal field component, and other CS parameters such as thickness, motion, vector current density, etc., and to make correlations with auroral activity as measured by the A sub e index. The satellite data used in the initial part of this study were from Explorer 28 and Explorer 34 satellites. Author

N74-23372*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH RESOLUTION OBSERVATIONS OF CASSIOPEIA A AT METER WAVELENGTHS
L. K. Hutton (Md. Univ., College Park), T. A. Clark (Md. Univ., College Park), W. C. Erickson (Md. Univ., College Park), G. M. Resch (Md. Univ., College Park), N. R. Vandenberg (Md. Univ., College Park), S. H. Knowles (NRL), and A. B. Youmans (NRL) May 1974 26 p refs Submitted for publication
(NASA-TM-X-70647; X-693-74-134) Avail: NTIS HC $4.50 CSCL 03A

Very long baseline interferometric (VLBI) observations of the supernova remnant Cassiopeia A, at 74 MHz with a 12,000-wavelength baseline and at 111 MHz with a 18,500-wavelength baseline, are reported. The fringe amplitudes are strongly varying on a time scale of about 15 to 30 minutes. The location of the extra source must lie outside the supernova remnant shell possibly associated with a concentration of emission north of the shell, or lying outside the gap in the northeastern side of the shell. The flux and spectral index deduced for the compact source depend on the assumed size, with a range of 100 Jy to 500 Jy at 74 MHz. If the source is associated with the supernova explosion, it must have been traveling at least 5000 km s/2. Author

N74-23373*# Linguistic Systems, Inc., Cambridge, Mass.
AMMONIA CONTENT IN THE VENUS ATMOSPHERE ACCORDING TO DATA FROM THE VENERA-8 PLANETARY PROBE
Yu. A. Surkov, B. M. Andreychikov, and O. M. Kalinkina Washington NASA May 1974 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 213, no. 2, 11 Nov. 1973 p 296-299
(Contract NASw-2482)
(NASA-TT-F-15544) Avail: NTIS HC $4.00 CSCL 03B

An instrument to measure the ammonia content in the Venus atmosphere is described. It was carried by the Venera-8 planetary probe during its Venus landing in July 1972. The instrument is based on a differential linearly-colorimetric method. The color change of the bromphenol blue in calcined silica gel when exposed to an ammonia-containing atmosphere is compared to it under certain standard conditions. The measurements were conducted at two levels (about 2 and 8 atmospheres). On the basis of these measurements, the volumetric content of the ammonia in the Venus atmosphere is estimated to be 0.01 to 0.1%. Author

N74-23374*# Washington Univ., Seattle. Dept. of Geophysics.
ROLE OF SUDDEN COMMENCEMENTS IN TRIGGERING MAGNETOSPHERIC SUBSTORMS M.S. Thesis
Richard Erin Newell 16 May 1974 65 p refs
(Grants NGR-48-002-154; NSF GA-33719; NSF GU-2655)
(NASA-CR-138227) Avail: NTIS HC $6.25 CSCL 03B

Sudden commencement events are examined in terms of available auroral-zone and low-latitude magnetic field, data, interplanetary plasma and magnetic field data, and magnetospheric electron flux and magnetic field data from the geostationary satellite ATS 1. Author

N74-23375*# Linguistic Systems, Inc., Cambridge, Mass.
OPTICAL PROPERTIES OF THE LOWER ATMOSPHERE OF VENUS (ON THE INTERPRETATION OF THE MEASUREMENTS FOR THE VENERA-8 AUTOMATIC INTERPLANETARY STATION)
L. G. Titarchuk Washington NASA May 1974 14 p refs Transl. into ENGLISH from the Russian report PR-139
(Contract NASw-2482)
(NASA-TT-F-15288; PR-139) Avail: NTIS HC $4.00 CSCL 03B

The results are presented from the interpretation of the illumination measurements in the lower atmosphere of Venus in the wavelength lambda region of 5,000-8,000 A. These measurements were obtained with the equipment installed on board the Venera-8 space probe. In order to construct an optical model of the lower Venusian atmosphere, the asymptotic theory of transfer of monochromatic radiation in a multilayer atmosphere was applied. The observational data agree well with the optical model of the atmosphere. The atmosphere consists of two layers sharply differing from each other in their optical and physical characteristics. The lower, purely gaseous layer--extending from 0 to 28 km--scatters conservatively in accord with Rayleigh's Law. The upper, cloudy layer--extending from 28 to 65 km--absorbs and scatters visible light nearly conservatively and has an effective optical thickness of 29-95. The upper part of the cloud layer--that part above 44 km--is more transparent than the lower part. Author

N74-23376*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TEMPERATURE AND ELECTRICAL CONDUCTIVITY OF THE LUNAR INTERIOR FROM MAGNETIC TRANSIENT MEASUREMENTS IN THE GEOMAGNETIC TAIL
Palmer Dyal, Curtis W. Parkin (Santa Clara, Univ.), and William D. Daily (Brigham Young, Univ.) Apr. 1974 35 p refs
(NASA-TM-X-62350) Avail: NTIS HC $4.75 CSCL 03B

Magnetometers were deployed at four Apollo sites on the moon to measure remanent and induced lunar magnetic fields. Measurements from this network of instruments were used to calculate the electrical conductivity, temperature, magnetic permeability, and iron abundance of the lunar interior. Global lunar fields due to eddy currents, induced in the lunar interior by magnetic transients in the geomagnetic tail field, were analyzed to calculate an electrical conductivity profile for the moon: the conductivity increases rapidly with depth from 10 to the minus 9 power mhos/meter at the lunar surface to .0001 mhos/meter at 200 km depth, then less rapidly to .02 mhos/meter at 1000 km depth. A temperature profile is calculated from conductivity: temperature rises rapidly with depth to 1100 K at 200 km depth, then less rapidly to 1800 K at 1000 km depth. Velocities and thicknesses of the earth's magnetopause and bow shock are estimated from simultaneous magnetometer measurements. Average speeds are determined to be about 50 km/sec for the magnetopause and 70 km/sec for the bow shock, although there are large variations in the measurements for any particular boundary crossing. Author

N74-23377*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VALUES OF THE PHOTOMETRIC PARAMETERS OF MARS AND THEIR INTERPRETATION
W. R. Weaver, W. E. Meador, and G. P. Wood Washington May 1974 17 p refs
(NASA-TM-X-71949) Avail: NTIS HC $3.00 CSCL 03B

Photometric data for the Martian disk obtained by Thorpe from television-camera pictures taken by Mariner 9 were used to derive values for the parameters in the photometric function. The photometric function can be applied to Mars and to the design of cameras for photography of Mars. Values of the parameters are for one wavelength only, 0.56 micros and are average or effective values for the Martian disk. The values derived were interpreted to provide semi-quantitative information on the soil. The results do not disagree with other indications that the effective mean diameter of the surface particles is about 400 micros. Another result is that the mean intercenter spacing of adjacent particles may be about 4/3 of the mean diameter. Author

N74-23378*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A SURVEY OF POSSIBLE MISSIONS TO THE PERIODIC COMETS IN THE INTERVAL 1974 - 2010
D. F. Bender 15 Apr. 1974 43 p refs
(Contract NAS7-100)
(NASA-CR-138456; JPL-TM-33-684) Avail: NTIS HC $5.25 CSCL 22A

Catalogs are developed to survey the mission possibilities for the short period comets. In the first the physical and pertinent orbital characteristics are given for 65 short period comets. The second catalog is one containing the predicted perihelia for each of the 65 comets between 1974 and 2010. Geometry is included to indicate feasibility of Earth-based observation and sighting within 100 days of perihelion. The comets are divided on the basis of size and activity into three groups from the data in the first catalog: primary, secondary and low interest. The perihelia are separated into two groups: satisfactory and not satisfactory on the basis of earth-comet distance. Author

N74-23379# Osservatorio Astrofisico di Arcetri, Florence (Italy).
[SOLAR SITE TESTING EXPEDITIONS]
[1973] 64 p refs
(Fasc-102) Avail: NTIS HC $6.25

Two expeditions to the island of Lampedusa and the island of Lampione in the Mediterranean Sea between Sicily and Tunisia, with the object of finding a site for a European Solar Observatory, are described. The micrometeorological instruments used for the expedition to the island of Lampione are discussed. For individual titles, see N74-23380 through N74-23381.

N74-23380 Osservatorio Astrofisico di Arcetri, Florence (Italy).
JOSO SITE TESTING CAMPAIGNS IN LAMPEDUSA AND LAMPIONE
G. Ceppatelli and A. Righini (Florence Univ.) *In its* Solar Site Testing Expeditions [1973] p 3-52 refs (For availability see N74-23379 14-30)
(Contract CNR-70.01109.02)

Two expeditions to the island of Lampedusa and the island of Lampione in the Mediterranean Sea between Sicily and Tunisia, with the objective of finding a site for a European solar observatory, are described. The cliff effect, an aerodynamical effect of a step in an otherwise homogeneous wind stream, is discussed. The sites investigated were found to be unsuitable for a solar observatory because of the turbulence of the air. ESRO

N74-23381 Osservatorio Astrofisico di Arcetri, Florence (Italy).
THE MICROMETEOROLOGICAL INSTRUMENTS FOR THE JOSO 1971 SITE-TESTING CAMPAIGN IN LAMPIONE
c14
R. Barletti, M. Meco, and S. Paloschi *In its* Solar Site Testing Expeditions [1973] p 53-64 refs (For availability see N74-23379 14-30)

The micrometeorological instruments used for the 1971 expedition to the island of Lampione in search of a site for a European solar observatory are described. ESRO

N74-23382*# California Univ., Riverside. Inst. of Geophysics and Planetary Physics.
THE RADIATION BELTS OF JUPITER
Kent G. Stansberry and R. Stephen White Nov. 1973 11 p refs Repr. from Science, v. 182, Dec. 1973 p 1020-1021 Submitted for publication Prepared in Cooperation with Aerospace Corp., El Segundo, Calif.
(Grant NGR-05-008-022; Contract N00014-69-A-0200-5004)
(AD-774885; IGPP-UCR-73-53; NASA-CR-138229; TR-13) Avail: NTIS HC $4.00 CSCL 03/2

Predictions of Jupiter's electron and proton radiation belts are based on the observed decimeter radiation coming from the vicinity of Jupiter and on the assumption that radial diffusion inward from the solar wind is the source of the radiation belts. Author (GRA)

N74-23383# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex. Atmospheric Sciences Lab.
MOONRISE, MOONSET AND MOON PHASES FOR 1974 AT WHITE SANDS MISSILE RANGE INCLUDING DAILY DECLINATIONS AND PERCENT ILLUMINATED, AND TIMES OF ECLIPSES, EQUINOXES AND SOLSTICES, WITH CONDENSED TABLES OF SUNRISE-SUNSET TIMES AND BEGINNINGS AND ENDINGS OF TWILIGHT Meteorological Data Report
George M. Fugate and Lamar Newman Dec. 1973 25 p
(DA Proj. 1T6-65702-D-127)
(AD-774856; DR-806) Avail: NTIS CSCL 03/1

Contents: Times of moonrise, moonset and moon phases at WSMR in 1974; and, use of solar-lunar charts and declination tables. GRA

N74-23384# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
ORIGIN OF SURFACE FEATURES OF THE MOON
E. Orowan Jun. 1973 61 p refs
(Contract F44620-72-C-0066; AF Proj. 9782)
(AD-775086; AFOSR-74-0179TR) Avail: NTIS CSCL 03/2

The usual lava-pool hypothesis of lunar tectonics seems incompatible with numerous features of the lunar surface, in addition to leaving other features unexplained. The lunar-body hypothesis, on the other hand, does not encounter similar difficulties and it provides simple explanations for many hitherto puzzling characteristics of the lunar surface. A simple calculation combining the Hertz theory of elastic contact with the Griffith biaxial theory of fracture explains the flatness of the crater floor, and the terraced wall, the polygonal shape of the indentation craters and the tangential rays around them are inertia effects due to the near-sonic velocity of crack propagation. (Modified author abstract) GRA

N74-22990 European Space Research Organization, Paris (France).
ESRO SATELLITE PROGRAMME RELATED TO SOUNDING ROCKET RESEARCH
G. P. Haskell *In its* European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 83-86 (For availability see N74-22980 14-13)

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N74-23385*# Northrop Services, Inc., Huntsville, Ala.
ADVANCED CONTROL CONCEPTS Final Report
J. B. Sharp and J. M. Coppey Dec. 1973 79 p refs
(Contract NAS8-29193)
(NASA-CR-120217; TR-250-1246) Avail: NTIS HC $7.00 CSCL 22B

The problems of excess control devices and insufficient trim control capability on shuttle ascent vehicles were investigated. The trim problem is solved at all time points of interest using Lagrangian multipliers and a Simplex based iterative algorithm developed as a result of the study. This algorithm has the capability to solve any bounded linear problem with physically realizable constraints, and to minimize any piecewise differentiable cost function. Both solution methods also automatically distribute the command torques to the control devices. It is shown that trim requirements are unrealizable if only the orbiter engines and the aerodynamic surfaces are used. Author

N74-23386*# Lockheed Missiles and Space Co., Palo Alto, Calif. Space Sciences Lab.
ANALYSIS OF ATS-5 DATA Final Report
Richard D. Sharp 8 Mar. 1974 66 p refs
(Contract NASw-2424)
(NASA-CR-138243; LMSC-D358586) Avail: NTIS HC $6.50

Data from the particle detectors on ATS-5 in synchronous orbit and from the meridian line of magnetometers at a ground station are correlated for periods of well defined substorm activity. Specific substorm events are presented whose region of maximum perturbation can be accurately identified using current systems modelling techniques. It was found that the impulsive particle response at ATS-5 is correlated with changes in the auroral electrojet structure during the development of the substorm expansive phase. The response of the particle detectors appears to differ from event to event depending on the geometry of the disturbed region of the magnetosphere. It is concluded that the substorm disturbance typically begins at low latitude and propagates poleward in impulsive steps and that energetic electron enhancements are observed at ATS-5 when the poleward border of the electrojet intensifies in the latitude range of the ATS-5 field line. Author

N74-23387*# Arkansas Univ., Little Rock. Dept. of Electronics and Instrumentation.
STUDY OF THE EFFECTS OF CONDENSATION ON THE PERFORMANCE OF PIONEER VENUS PROBE WINDOWS Final Technical Report
M. K. Testerman 15 Mar. 1974 107 p refs
(Grant NGL-04-001-007)
(NASA-CR-138254) Avail: NTIS HC $8.50 CSCL 22B

The transmission loss of Pioneer Venus Probe radiation windows if their exposed surfaces become contaminated with droplets of water, hydrochloric acid, sulfuric acid, and mercury which may be found in the Venusian atmosphere was investigated. Transmission loss was studied as a function of mass concentration of liquid droplets deposited on one surface of test window materials while the wavelength of the transmitting radiation is in the range of 0.3 to 30 microns. The parameters that affect the transmittance of radiation through a window are: (1) particle size, (2) surface concentration of particles, (3) wavelength of the radiation, (4) angle of acceptance of the radiation by the detector, and (5) the refractive index of the aerosol. Author

N74-23388*# Naval Ammunition Depot, Crane, Ind. Quality Evaluation and Engineering Lab.
EVALUATION PROGRAM FOR SECONDARY SPACECRAFT CELLS. INITIAL EVALUATION TESTS OF GENERAL ELECTRIC COMPANY 8.0 AMPERE-HOUR NICKEL-CADMIUM SPACECRAFT CELLS WITH AUXILIARY ELECTRODES FOR THE SMALL ASTRONOMY SATELLITE (SAS-C)
J. D. Harkness 17 Apr. 1974 27 p
(NASA Order S-23404-G)
(NASA-CR-138191; QEEL/C-74-252) Avail: NTIS HC $4.50 CSCL 22B

Cells were screened for electrolyte leakage, internal shorts, low capacity, or inability of any cell to recover its open-circuit voltage above 1.150 volts during the internal short test. The average weight of the teflon covered negative plate cells was 10.5 grams heavier than that of the standard plate cells. The standard plate cells exhibited higher average end-of-charge (EOC) voltages than the cells with teflon covered negative plates; but were lower than or equal to the capacity out in ampere-hours of the teflon plate cells following these charges. Author

N74-23389*# Chrysler Corp., New Orleans, La.
RESULTS OF TESTS 0A12 AND IA9 IN THE AMES RESEARCH CENTER UNITARY PLAN WIND TUNNELS ON AN 0.030 SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 2A TO DETERMINE AERODYNAMIC LOADS, VOLUME 16
R. H. Spangler (Rockwell Intern.) Apr. 1974 934 p
(Contract NAS9-13247)
(NASA-CR-128794-Vol-16; DMS-DR-2032-Vol-16) Avail: NTIS HC $49.75 CSCL 22B

Tests were conducted in the NASA/ARC Unitary Plan Wind Tunnels on an 0.030 scale replica of the space shuttle vehicle Configuration 2A. Aerodynamic loads data were obtained at Mach numbers from 0.6 to 3.5. The integrated vehicle was tested at angles of attack and sideslip from -8 degrees to +8 degrees. The isolated orbiter was tested at angles of attack from -15 degrees to +40 degrees and angles of sideslip from -10 degrees to +10 degrees as dictated by trajectory considerations. The effects of orbiter/external tank incidence angle and deflected control surfaces on aerodynamic loads were also investigated. Author

N74-23390*# Chrysler Corp., New Orleans, La.
RESULTS OF TESTS 0A12 AND IA9 IN THE AMES RESEARCH CENTER UNITARY PLAN WIND TUNNELS ON AN 0.030 SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 2A TO DETERMINE AERODYNAMIC LOADS, VOLUME 17
R. H. Spangler (Rockwell Intern.) Apr. 1974 1163 p
(Contract NAS9-13247)
(NASA-CR-128794-Vol-17; DMS-DR-2032-Vol-17) Avail: NTIS HC $64.25 CSCL 22B

For abstract, see N74-23389.

N74-23391*# Techtran Corp., Glen Burnie, Md.
ARCHITECTURE OF A STELLAR HOME
I. Belyakov, Docent Yu. Borisov, and A. Tkachev Washington NASA May 1974 6 p Transl. into ENGLISH from Sotsialisticheskaya Industriya, 15 Jan. 1973 p 3
(Contract NASw-2485)
(NASA-TT-F-15506) Avail: NTIS HC $4.00 CSCL 22B

The future orbital station will be spherical or cylindrical and constructed in modules put into space separately. They will either move under their own power or be handled by a space 'tug.' Application of a balloon-like construction method using elastic films and 'plastic metals' is possible. The structure must be strong enough to withstand micrometeorite impact and ensure cosmonaut safety. The most complex problem is that of conveying the necessary scientific equipment to the orbital stations. Author

N74-23392*# Santa Clara Univ., Calif.
STABILITY REGION MAXIMIZATION BY DECOMPOSITION-AGGREGATION METHOD Final Report, Apr. 1973 - Jan. 1974
D. D. Siljak and S. M. Cuk Washington NASA May 1974 76 p refs
(Contract NAS8-27799)
(NASA-CR-2428) Avail: NTIS HC $4.00 CSCL 22B

This work is to improve the estimates of the stability regions by formulating and resolving a proper maximization problem. The solution of the problem provides the best estimate of the maximal value of the structural parameter and at the same time yields the optimum comparison system, which can be used to determine the degree of stability of the Skylab. The analysis procedure is completely computerized, resulting in a flexible and powerful tool for stability considerations of large-scale linear as well as nonlinear systems. Author

N74-23393*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
A SUMMARY OF MAJOR NASA LAUNCHINGS, 1 OCTOBER 1958 - 30 SEPTEMBER 1973
Oct. 1973 169 p refs
(NASA-TM-X-70078; KHR-1-Rev) Avail: NTIS HC $11.50 CSCL 22D

This report was compiled from several different sources. Documents consulted included: Operations Summaries, post-launch Flash Flight Reports, Final Field Reports, Mission Operations Reports (both pre-launch and post-launch), and Satellite Situation Reports. Other major references were publications of the NASA Historical Office, such as: Aeronautics and Astronautics 1916-1960; Aeronautical and Astronautical Events of 1961-1962; Aeronautics and Astronautics (yearly editions since 1963); and NASA's Pocket Statistics (published monthly.) The report is divided into projects within broad mission categories, with each project being treated chronologically. Mission results have been categorized as: successful (S); unsuccessful (U); or, partially successful (P). These are arbitrary classifications, made after a comparison of objectives and actual results. Author

N74-23394*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUPERSONIC AND HYPERSONIC AERODYNAMIC CHARACTERISTICS OF TWO SHUTTLE-ORBITER CONFIGURATIONS DESIGNED FOR REDUCED LENGTH
Howard W. Stone Apr. 1974 54 p refs
(NASA-TM-X-71956) Avail: NTIS HC $3.75 CSCL 22B

Performance, stability, and control tests at supersonic and hypersonic speeds have been performed on two versions of a shuttle orbiter configuration designed for reduced length. One of the test configurations had twin dorsal fins rolled out 15 deg the other a centerline single dorsal fin. Effects of elevon and body deg flap deflection, rudder flare, planform fillet, and aileron deflection were examined. The supersonic tests were over the Mach number range from 1.6 to 4.63 at a Reynolds number based on model length of 4,300,000. The hypersonic tests were conducted at a Mach number of 10.3 and Reynolds number of 670,000. Author

N74-23395# Gulf Energy and Environmental Systems, Inc., San Diego, Calif.
BEGINNING OF MISSION FLIGHT DATA ON THE TRANSIT RTG
George B. Bradshaw and Frank D. Postula Aug. 1973 9 p refs Backup document for AIAA Synoptic scheduled for publication in Journal of Spacecraft and Rockets in Sep. 1974
(Contract AT(25-2)-2564)
(GULF-GA-A12711) Avail: NTIS HC $4.00 CSCL 22C

The TRANSIT RTG was launched aboard a Scout missile into a nearly circular polar orbit. Electrical and thermal data were obtained on the RTG during ascent and for the first month in space and are presented. Analysis of the flight data has been performed to verify electrical output of the RTG, determine the effects of the space environment on its operation, and evaluate stability of the device. Instrumentation used on the TRANSIT RTG has permitted an evaluation of the transient performance of individual thermoelectric panels in space. Experience gained during this program is useful for designing other space RTG systems, evaluating diagnostic instrumentation and sensitivity of experimental data, evaluating thermal control surfaces, and the efficiency of multi-foil insulation systems in the space vacuum environment. Author

N74-23396*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: DATA MANAGEMENT FOR POSTFLIGHT ENGINEERING EVALUATION
Galloway B. Foster, Jr. Washington May 1974 17 p
(NASA-TN-D-7684; JSC-S-393) Avail: NTIS HC $3.00 CSCL 05B

The Apollo management of data for postflight engineering evaluation is described. The sources of Apollo telemetry data, the control of data processing by a single data team, the data techniques used to assist in evaluation of the large quantity of data, and the operation of the data team before the mission and during the evaluation phase are described. The techniques used to ensure the output of valid data and to determine areas in which data were of questionable quality are also included. Author

N74-23397*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: FLIGHT-CONTROL DATA NEEDS, TERMINAL DISPLAY DEVICES, AND GROUND SYSTEM CONFIGURATION REQUIREMENTS
Richard A. Hoover Washington May 1974 13 p
(NASA-TN-D-7685; JSC-S-396) Avail: NTIS HC $3.00 CSCL 22D

The development of flight-control facilities for the Apollo program is reviewed from the viewpoint of the user organization. These facilities are treated in three categories: data systems, ground-based display and control systems, and configuration management. The effects of certain Apollo program factors on the selection, sizing, and configuration management of these systems are discussed. Recommendations are made regarding improvement of the systems and the reduction of system sensitivity to the program factors. Author

N74-23398*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: COMMUNICATIONS USED DURING RECOVERY OPERATIONS
John E. Hoover Washington May 1974 10 p
(NASA-TN-D-7686; JSC-S-398) Avail: NTIS HC $3.00 CSCL 22B

Apollo program experience in recovery-support communications is reviewed, and the working relationships among NASA, the Department of Defense, and commercial communications facilities are discussed. The organization, facilities, philosophy, and funding of recovery-support communications are described. The relocation of two recovery control centers is discussed, as are the functions of primary and secondary recovery ships, aircraft, and relay satellites. The possibility of using ships of opportunity for recovery operations is considered. Finally, the means by which money, manpower, and resources have been saved and longlines leased are delineated. Author

N74-23399*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: TEST AND CHECKOUT
Joseph E. Mechelay Washington May 1974 41 p
(NASA-TN-D-7683; JSC-S-392) Avail: NTIS HC $3.25 CSCL 22B

The problem areas encountered during the development of the acceptance testing and preflight checkout requirements and procedures for Apollo spacecraft are discussed. Recommendations are given for cases in which methods used in the Apollo program are considered to apply to future space flight programs. Author

N74-23400# National Aerospace Lab., Tokyo (Japan).
THE STUDY ON THE MOTION OF AN ARTIFICIAL EARTH SATELLITE UNDER THE GRAVITATIONAL ATTRACTIONS OF THE SUN AND MOON
Sumio Takeuchi and Koichi Matsushima Jul. 1973 27 p refs In JAPANESE; ENGLISH summary
(NAL-TR-323) Avail: NTIS HC $4.50

The effects of the gravitational attractions of the sun and moon on the motion of an artificial earth satellite are investigated using Lagrange's planetary equations. The complete gravitational disturbing function expressed in osculating elliptic elements is used. As regards the orbital elements of the disturbing body, it is assumed that the semimajor axis, the eccentricity and the inclination of the orbital plane are constants and that the longitude of the ascending node, the argument of the perigee and the mean anomaly are linear functions of time. Neglecting the coupling effects between the oblateness of the earth and the attraction of the disturbing body, perturbations of the first order are determined. The theory is applied to the orbit of a geostationary satellite and the variations of orbital elements are calculated. On the basis of the results of computations, the initial conditions giving orbits that have inclination variations amounting to a few degree for two or three years are determined. Author

N74-23401# National Aerospace Lab., Tokyo (Japan).
ACTIVE NUTATION CONTROL OF A SPINNING AXI-SYMMETRIC SATELLITE USING A GAS JET
Chikara Murakami and Atsushi Nakajima Oct. 1973 19 p refs In JAPANESE; ENGLISH summary
(NAL-TR-344) Avail: NTIS HC $4.00

Active nutation control of an axi-symmetric satellite using an axial gas jet during one spin period is analyzed to determine the jet firing time. A formula is derived which indicates magnitude and phase of the nutation before and after the jet firing. This formula represents the same contents as those when the jet fires impulsively at the middle time of the assumed firing interval. The relationship between the jet timing, initial, and remaining nutation angles is analyzed. A graphical method which represents the above-mentioned relationship is proposed. Several digital computer simulation results verify the method. Author

N74-23402# Ecole Nationale d'Ingenieurs de Constructions Aeronautiques, Toulouse (France). Div. Missiles.
PRELIMINARY STUDY OF A REENTRY BODY [ETUDE PRELIMINAIRE D'UN CORPS DE RENTREE]
Jean Dominique Marini and Jean Yves Prado 1973 109 p refs In FRENCH
Avail: NTIS HC $8.50

A preliminary study for re-entry dimensioning of a 200 kg class satellite in earth circular orbit is presented. A tapered cone shape is assumed. The re-entry conditions are determined from an altitude scan in intensity and direction of the transfer orbit impulsion. The variations of the CX as a function of Mach number, an atmospheric table, and the overall satellite mass are assumed to be given. An iterative method was used to perform the dimensional analysis of the re-entry body given the ablative nose cone thickness temperature distribution and mechanical characteristics of the component materials at various temperatures. Buckling calculations are detailed. The mass balance derived from this study is applied to the rocket characterization and thrust required to orient the re-entry body. ESRO

N74-23403# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Dept.
TEST PROCEDURE FOR TESTING OF SANDWICH FASTENERS FOR EUROPE 3-VEB

P. C. VanDeWaal 23 Oct. 1972 10 p
(FOK-RV-73-169) Avail: NTIS HC $4.00

Procedures for static testing of sandwich fasteners for the Europa 3 vehicle equipment bay cone are described. Tests proposed are: (1) a tension test to measure static strength of an insert with respect to loads in the insert perpendicular to the plane of the sandwich, (2) a shear test to measure the static strength of an insert with respect to loads in the insert parallel to the plane of the sandwich, and (3) a torque test to measure static strength of an insert with respect to torsion moments on the insert in the plane of the sandwich. ESRO

N74-23404# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Dept.
TEST PLAN FOR THE CONE EDGES OF EUROPA 3-VEB
J. Seebolt 11 Dec. 1972 15 p
(FOK-RV-73-171) Avail: NTIS HC $4.00

The purpose of the test plan is to measure the static strength of the top and bottom edges of the sandwich cone under eccentric compression loads. ESRO

N74-23405# Naval Weapons Lab., Dahlgren, Va.
AERODYNAMICS OF GUIDED AND UNGUIDED WEAPONS. PART 2: COMPUTER PROGRAM AND USAGE
Frank G. Moore and C. William McKerley Jan. 1974 174 p refs
(AD-775300; NWL-TR-3036-Pt-2) Avail: NTIS CSCL 16/4

The report describes a computer program for calculating static forces and moments on canard-body-tail configurations. The program is applicable in the Mach number range, 0 = or < (M sub infinity) = or < 3, and angle of attack range, 0 = or < alpha < 20 degrees. The theoretical development of the methods used in the program is given in Part I of the report; however, for reference purposes, the various theories used are listed herein. A detailed description of the program usage, including input and output quantities, is also given. Several example cases are considered and the calculated aerodynamics compared with experimental data. In general, accuracies of plus or minus 10% can be expected for normal force and drag and the center of pressure is expected to be accurate to within plus or minus 8% of the body length. (Modified author abstract) GRA

N74-23406# General Electric Co., Philadelphia, Pa. Reentry and Environmental Systems Div.
ELECTRON DENSITY DISTRIBUTION OVER BLUNT BODIES IN THREE DIMENSIONAL FLOW
Henry G. Lew Oct. 1973 55 p refs
(Contract F19628-72-C-0070; AF Proj. 4642)
(AD-776032; DOC-73SD2180; SR-Q; AFCRL-TR-73-0671)
Avail: NTIS CSCL 16/2

The electron density distribution in the shock layer of reentry bodies in hypersonic flight is determined by many factors. Among these, the effect of a nonzero angle-of-attack of the body to the free stream is an important one. The report considers the three dimensional boundary layer over a sphere-cone body at hypersonic flight and a nonzero angle-of-attack at conditions where the air is a mixture of dissociated and ionized components reacting with each other at finite chemical rates. The equations of motion for the three dimensional flow are formulated and method of attack by an implicit finite difference scheme is used for their solutions. GRA

N74-22930 European Space Research Organization, Paris (France).
THE OPTIMIZATION OF THE APOGEE IMPULSE DURING THE POSITIONING OF A GEOSTATIONARY SATELLITE
Dominique Biausse, Jean-Pierre Marec et al *In its* La Rech. Aerospatiale, Bi-monthly Bull. No. 1973-1 (ESRO-TT-37) Mar. 1974 p 11-34 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel (Paris), no. 1973-1, Jan.-Feb. 1973 p 5-15 (For availability see N74-22928 14-12)

N74-22986 Max-Planck-Institut fuer Extraterrestrische Physik, Munich (West Germany).
SOUNDING-ROCKET PAYLOADS DEVELOPED AT THE MAX-PLANCK-INSTITUT FUER EXTRATERRESTRISCHE PHYSIK FROM 1970 - 1973 FOR RESEARCH AT HIGH LATITUDES
J. E. Stoecker *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 53-59 (For availability see N74-22980 14-13)

N74-23010 Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).
A NEW HIGH-ALTITUDE ROCKET SYSTEM
J. Simon and W. T. Fisher (Bristol Aerojet Ltd.) *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 227-234 refs (For availability see N74-22980 14-13)

N74-23011 British Aircraft Corp. (Operating) Ltd., Bristol (England). Electronic and Space Systems Group.
SKYLARK 12, A HIGH-ALTITUDE SOUNDING ROCKET FOR 44 cm-DIAMETER PAYLOADS OF UP TO 200 kg MASS
D. J. Brown and J. W. Furst *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 235-243 refs (For availability see N74-22980 14-13)

N74-23012 Bristol Aerospace, Ltd., Winnipeg (Manitoba).
BLACK BRANT VEHICLES AND SYSTEMS
W. J. Thiessen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 245-250 (For availability see N74-22980 14-13)

N74-23013 Space Vector Corp., Northridge, Calif.
THE USE OF APPROXIMATE ANALYSES TO DETERMINE THE PERFORMANCE, AUTHORITY, AND IMPULSE OF SOUNDING-ROCKET BOOST-CONTROL-SYSTEMS
C. P. Hoult *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 251-260 refs (For availability see N74-22980 14-13)

N74-23016 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
SPECIAL TEST AND HARDWARE EQUIPMENT AT THE DFVLR MOBILE RAKETENBASIS
D. Joneleit *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 291-293 (For availability see N74-22980 14-13)

N74-23517 European Space Research Organization, Paris (France).
DETERMINATION OF A STRUCTURE'S ELGEN MODES BY A VIBRATION TEST WITH NON-SELECTIVE EXCITATION
Rolland Dat (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 97-118 ref Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 99-108 (For availability see N74-23512 14-34)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-23407 Notre Dame Univ., Ind.
ANALYSIS AND DESIGN OF AXISYMMETRIC REINFORCEMENT AROUND A CIRCULAR HOLE IN A THIN FLAT PLATE BY THE FINITE ELEMENT METHOD Ph.D. Thesis
George Joseph Murnen 1974 140 p
Avail: Univ. Microfilms Order No. 74-8905

Axisymmetric finite elements are adapted to the analysis of thin flat plates with centrally located circular holes which may be either reinforced with an axisymmetric reinforcement or be unreinforced. These plates may be subjected to uniaxial stress fields or equal and unequal biaxial stress fields. The axisymmetric finite element provides a three dimensional solution which determines stress concentrations at all points where changes in cross section occur as well as at the edges of the hole. Dissert. Abstr.

N74-23408 University of Southern Calif., Los Angeles.
STABILITY OF SPATIAL SYSTEMS COMPOSED OF SLENDER BARS Ph.D. Thesis
Gregory Szuladzinski 1973 259 p
Avail: Univ. Microfilms Order No. 74-9090

Structural stability problems were studied for the following systems: beams with elastic supports, trusses, frames, arches, beam gridworks, and latticed domes. The load-deflection properties in the direction transverse to a beam are described. The axial stiffness, which exhibits a strong nonlinearity was examined in detail and the findings are incorporated in the spatial stiffness matrix for the member. The deterioration of properties caused by deflection is best illustrated in a dome stability problem. A systematic method of discretization of beams and arches is developed which replaces the actual elastic system by a kinematic chain of rigid links connected by springs. Upon the analysis of this simplified structure the results are expressed in terms of the properties of the actual system. The geometric proportions of members are limited to the range which represents a viable design. Dissert. Abstr.

N74-23409 University of Southern Calif., Los Angeles.
IMPEDANCE INDUCTION AND LASER INVESTIGATION ON DYNAMICS OF MASS LOADED STRUCTURES Ph.D. Thesis
Stuart Yuen Lee 1973 313 p
Avail: Univ. Microfilms Order No. 74-9076

The dynamic response of mass-loaded structure such as beams, plates, rings, and shells were studied. The study results were then compared with the response of the unloaded structures. The mass loading was provided by discrete masses mounted on the conventional uniform structures. New developments and/or improvements were made on the impedance, induction and laser techniques. Inductive or noncontact testing eliminated the shaker mass, elasticity, instrumentation mass, and other effects. Impedance and laser techniques also permitted some improved analysis and instrumentation. Laser holograms were used for describing the mode shapes in three dimensions while laser movies permitted the recording of the gradual shifting from one mode shape to another as the frequency changes; thus a four dimensional study of the dynamic response and transmissibility characteristics for the entire frequency spectrum is possible. Dissert. Abstr.

N74-23410 Cornell Univ., New York.
PLASTIC ANALYSIS OF FIBER REINFORCED SHELLS INCORPORATING A MAXIMUM SHEAR STRESS THEORY FOR THE YIELDING OF THE MATERIAL Ph.D. Thesis
Benjamin Isaac Bachrach 1973 111 p
Avail: Univ. Microfilms Order No. 74-6371

The yield surfaces for shells of revolution which are loaded axisymmetrically and made of an anisotropic rigid perfectly plastic material which obeys the maximum shear stress theory formulated by Lance and Robinson are developed in this thesis. The material is a model of a ductile matrix reinforced unidirectionally with ductile fibers. The graphical technique proposed by Onat and Prager is used to determine the yield surface for uniform and laminated shells with the reinforcing fibers aligned with a principal stress direction. The yield surface for uniform cylindrical shells with arbitary fiber orientation is developed as well as the yield conditions for reinforced ideal sandwich shells. The yield surfaces are used to determine bounds on the limit load of reinforced uniform, laminated, and sandwich cylindrical shells subjected to a ring of pressure. The complete solution to the problem of the plastic analysis of a shallow conical shell loaded by an axisymmetric lateral force applied to a rigid central boss is obtained, for circumferentially reinforced and radially reinforced uniform and sandwich shells. Dissert. Abstr.

N74-23411 Wisconsin Univ., Madison.
LIAPUNOV STABILITY OF ROTATING, ELASTIC DYNAMIC SYSTEMS Ph.D. Thesis
Weng Nan Dong 1973 139 p
Avail: Univ. Microfilms Order No. 73-30314

A general analysis in conjunction with Liapunov's direct method is presented to determine stability of rotating, elastic dynamic systems. The vibration of the elastic components is expressed in terms of either a complete set of modal functions or admissible functions. The Hamiltonian function for the system, which is expressed in terms of these functions, is utilized directly as a testing function to derive the stability criteria. Sylvester's criterion, as applied to the principal minors of the Hessian matrix, yields a closed-form set of sufficient stability conditions leading to an easy assessment of truncation error. Several applications of this method of analysis are presented, the first being a study of the spin stability of a system consisting of a rigid body with an elastic cylindrical shell component. Dissert. Abstr.

N74-23412*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE CIRCUMFERENTIALLY NOTCHED CYLINDRICAL BAR AS A FRACTURE TOUGHNESS TEST SPECIMEN
W. F. Brown, Jr. [1974] 21 p refs Proposed for presentation at Symp. on Linear Fracture Mech., Bethlehem, Pa., 29-30 Jul. 1974; sponsored by Lehigh Univ.
(NASA-TM-X-71551; E-7933) Avail: NTIS HC $4.25 CSCL 20K

A brief review is given of the application of the notched cylinder as a screening specimen for use in sorting materials in respect to their relative levels of plane strain fracture toughness and a discussion of fracture mechanics applications including Irwin's important contributions in this area. In addition, practical problems encountered in application of this specimen will be presented. Author

N74-23413# Advisory Group for Aerospace Research and Development, Paris (France).
FRACTURE MECHANICS OF AIRCRAFT STRUCTURES
Harold Liebowitz, ed. (George Washington Univ.) Jan. 1974 624 p refs
(AGARD-AG-176; AGARDograph-176) Avail: NTIS HC $34.25

The proceedings of a conference on the structural analysis of airframes and aircraft components are presented. The subjects discussed include the following: (1) history of aircraft loading and examples of aircraft failure, (2) application of fracture mechanics principles in the design and analysis of damage tolerant aircraft structures, (3) fail safe design procedures, (4) experimental techniques for determining fracture toughness, and (5) flaw detection methods. For individual titles, see N74-23414 through N74-23445.

N74-23414 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
SPECTRUM OF LOADING OF AIRCRAFT
Howard A. Wood *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 3-7 refs (For availability see N74-23413 14-32)

A summary of airframe service loadings and experience is presented. The areas of concern are: (1) the structural environment, (2) the operational environment, (3) the internal airframe environment, and (4) frequency of occurrence and significance of airframe loadings. Diagrams are presented for typical load profile for tactical aircraft on a conventional delivery mission and the flight-profile for a transport aircraft wing root. Author

N74-23415 Royal Aircraft Establishment, Farnborough (England).
EXAMPLES OF AIRCRAFT FAILURE
W. T. Kirkby *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 8-13 (For availability see N74-23413 14-32)

Examples of structural failure of aircraft components are presented to show the importance of structural design and reliability engineering. Photographs of typical aircraft components are provided to show the type of failure and the degree of impairment. The examples include the following: (1) pressure cabin skin cracking, (2) landing gear door uplock failure, (3) rotor blade extrusion cracking, (4) wheel casting failure, and (5) typical defects in spar booms. Author

N74-23416 Army Materials and Mechanics Research Center, Watertown, Mass.
FRACTURE REGIMES
J. I. Bluhm *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 14-17 refs (For availability see N74-23413 14-32)

An analysis of the effects of ambient conditions on the fracture characteristics of materials is presented. A schematic diagram is provided to show range of applicable strength approaches. Stress-strain diagrams are developed of the limit stresses in notched plates and notched cylinders in tension. The considerations for fracture characteristics are examined with respect to: (1) linear fracture mechanics, (2) limit design for temperature extremes, and (3) transition approaches based on various structural analysis tests. The effect of superimposed hydrostatic pressure on strain to fracture and the effects of temperature and/or strain rate are illustrated. The variation in stress state in the vicinity of a notch in a thick plate is analyzed. Author

N74-23417 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

THE USE OF FRACTURE MECHANICS PRINCIPLES IN THE DESIGN AND ANALYSIS OF DAMAGE TOLERANT AIRCRAFT STRUCTURES

Howard A. Wood *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 18-31 refs (For availability see N74-23413 14-32)

The application of fracture control principles to aircraft design in order to produce safer structures is discussed. The mechanical and physical properties of the construction materials which are capable of modification to produce the desired strength are discussed. The selected of materials for airframes is based on requirements established through actual failure experience and service life data. The nature of the requirements and allowances in their application are defined. Tables of data are provided to show the inspection requirements for cases of: (1) slow crack growth structure, (2) crack arrest structure, and (3) fail-safe structure. Author

N74-23418 George Washington Univ., Washington, D.C.

BASIC CONCEPTS IN FRACTURE MECHANICS

John Eftis, Douglas L. Jones, and Harold Liebowitz *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 32-73 refs (For availability see N74-23413 14-32)

A review of fracture mechanics is presented highlighting the strengths and limitations and establishing dome perspective of its relationship to the general fracture process. The importance of nondestructive inspection as one of several potential safegurads against failure by fracture is stressed. The subjects discussed include: (1) macroscopic classification of fracture, (2) linear elastic fracture mechanics, (3) fracture toughness in semibrittle fracture, (4) applications of fracture mechanics concepts, and (5) fatigue crack growth characteristics. Author

N74-23419 Army Materials and Mechanics Research Center, Watertown, Mass.

RESISTANCE METHOD

J. I. Bluhm *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 74-88 refs (For availability see N74-23413 14-32)

A method of determining the strength of materials based on the resistance to fracture with increasing crack length is described. The criteria for stable crack growth for a variety of specimens for both load controlled and/or displacement controlled systems are expressed by a mathematical model. The various conditions which can affect the resistance to fracture of a material are analyzed. Curves are developed to show: (1) schematic resistance/energy release rate changes in crack length, (2) constant load/constant deflection energy release rate curves for a tension specimen, and (3) constant load/constant deflection energy release curves for a bending specimen. Author

N74-23420 Army Materials and Mechanics Research Center, Watertown, Mass.

THE KUHN-HARDRATH METHOD

J. I. Bluhm *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 89-94 refs (For availability see N74-23413 14-32)

A procedure for determining the residual strength of a structural member which contains a damaged area is discussed. The damage covers the spectrum from a notch to its degenerate and generally most severe configuration, which is a crack. The method starts with an expression for the elastic stress concentration and recognizes that the maximum effective stress from a fracture point of view is not merely the nominal stress multiplied by a stress concentration factor. Instead, a concept is introduced to attempt to account for the microscopic heterogeneity of the material. The theoretical considerations are supported by mathematical models. Curves are developed to show the energy relations for fast and slow crack growth and the relation between sheet width and residual strength. Author

N74-23421 Army Materials and Mechanics Research Center, Watertown, Mass.

CRACK PROPAGATION LAWS

J. I. Bluhm *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 95-109 refs (For availability see N74-23413 14-32)

A numerical analysis of the principles of crack propagation is presented. Mathematical models are developed to show the relations between cyclic crack growth rates to various functions of the instantaneous crack length and the alternating stress. The effects of programmed and random loading on the stability of airframes are analyzed and mathematical dependences are reported. The influences of geometry and/or structural considerations on structural stability are investigated. Author

N74-23422 Cornell Univ., Ithaca, N.Y.

ENVIRONMENTAL EFFECTS IN FRACTURE

H. H. Johnson *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 110-117 refs (For availability see N74-23413 14-32)

The characteristics of environmental cracking of aircraft structures are presented. A test method for evaluating the susecptibility of a structure to environmental cracking is described. The application of linear elastic fracture mechanics to predict and interpret environmental cracking phenomena when crack propagation is the controlling feature is discussed. Curves are developed to show (1) a comparison of threshold stress intensities for three specimen configurations (2) constant crack growth rate in a constant stress intensity test, (3) crack growth rate versus field intensity, and (4) correlation of hydraulic activator and surface flawed specimen results. Author

N74-23423 Army Materials and Mechanics Research Center, Watertown, Mass.

SUMMARY OF LIMITATIONS

J. I. Bluhm *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 118-120 refs (For availability see N74-23413 14-32)

The limitations affecting the applicability of mechanics to the fracture process are discussed. Methods for conducting stress state analysis are presented to include the following: (1) crack opening displacement, (2) resistance method, and (3) the Kuhn-Hadrath method. A list of factors which influence the crack propagation behavior is developed. Author

N74-23424 Technische Hogeschool, Delft (Netherlands).

FAIL-SAFE DESIGN PROCEDURES: BASIC INFORMATION

David Broek *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 121-166 refs (For availability see N74-23413 14-32)

The application of fail-safe concepts to the design of aircraft structures is discussed. The subjects considered are: (1) plane strain problems in heavy members with surface flaws, (2) plane stress and transitional modes in sheet structures, (3) fatigue crack propagation characteristics, and (4) the prediction of crack propagation. Graphs are developed to show residual strength characteristics in plane stress. Mathematical models are included to support the theoretical considerations. Author

N74-23425 Technische Hogeschool, Delft (Netherlands).

THE PREDICTION OF CRACK PROPAGATION

David Broek *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 167-180 (For availability see N74-23413 14-32)

The factors which affect the application of fail-safe techniques in aircraft design are discussed. The load-time histories and flight-load profiles are analyzed on the basis of the following: (1) gust, maneuvers, and taxiing loads were assumed to occur as one cycle, (2) the sequence of loads was assumed random without correlation, and (3) flight profiles may differ from flight to flight, especially with respect to the large cycles and the number of cycles. Methods for estimating fatigue crack propagation are analyzed. The crack propagation life for various materials is tabulated. Author

N74-23426 Technische Hogeschool, Delft (Netherlands).
BUILT-UP SHEET STRUCTURES
David Broek *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 181-193 refs (For availability see N74-23413 14-32)

The mechanical properties of built up sheet structures under conditions of crack propagation and stress intensity are discussed. The procedure to calculate the stress intensity factor of a reinforced panel is illustrated. Graphs are developed to show the fatigue crack growth rate in stiffened panels. The factors which affect the accuracy of crack growth prediction are analyzed. The effects of stop holes on the structural integrity of sheet structures are reported. Author

N74-23427 National Aerospace Lab., Amsterdam (Netherlands).
BUILT-UP SHEET STRUCTURES, WINGS
H. Vlieger and David Broek (Technische Hogeschool, Delft, Netherlands) *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 195-225 refs (For availability see N74-23413 14-32)

The residual strength of sheet structures under conditions of plane stress is discussed. The basic fracture behavior of a stiffened panel is explained. The principles for calculating the residual strength of aircraft structures are analyzed. Curves are developed to show the residual strength of stiffened and unstiffened panels for various configurations. Mathematical models of the factors involved in residual strength calculations are provided. Author

N74-23428 Douglas Aircraft Co., Inc., Long Beach, Calif.
THE APPLICATION OF FRACTURE MECHANICS IN THE DEVELOPMENT OF THE DC-10 FUSELAGE
T. Swift *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 226-287 refs (For availability see N74-23413 14-32)

The degree of damage tolerance used in the design of the DC-10 fuselage pressure shell is discussed with reasons for its selection. Analysis methods are presented for the prediction of the residual strength of damaged, stiffened panels, based on the Matrix Force solution of an idealized structure combined with fracture mechanics equations. The effects of attachment flexibility, which play an important part in the residual strength of damaged structure, are accounted for. Crack growth retardation due to the plastic zone formed on high load cycles and its effect on propagation under spectrum loading is discussed. It is shown that the stress intensity at the threshold of slow stable growth is not only a material property but depends almost entirely on past load history. A description of the development test program to verify the analytical techniques and to substantiate the fail-safe strength of the fuselage shell is given together with the results of many of the tests. Author

N74-23429 Royal Aircraft Establishment, Farnborough (England).
HEAVY SECTIONS
W. T. Kirkby *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 288-293 refs (For availability see N74-23413 14-32)

Methods for predicting the residual strength of relatively thick structures under plane strain conditions are presented. The problems are discussed in relation to heavy members with surface flaws, corner cracks at holes, and other natural cracks. Practical examples of the application of the procedure are provided. Mathematical models are included to show the relation of the various parameters involved in the structural analysis. Author

N74-23430 Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
AEROSPACE PRESSURE VESSELS
C. F. Tiffany *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 294-313 refs (For availability see N74-23413 14-32)

During the development of the many pressure vessels used in the Apollo Program several serious failures were encountered. In some cases through-the-thickness cracks formed and the vessels leaked. In other cases, small surface or embedded flaws grew to critical size prior to growing through the thickness of the vessel wall and catastrophic failure. Several of the different types of pressure vessel failures which have been encountered are reviewed. A discussion of the important considerations and the general technical approach being used to prevent failures in the future are presented. This encompasses many considerations ranging from initial material selection through the final acceptance of individual batches of propellant based on the results of fracture specimen tests. Examples of static fracture toughness and subcritical flaw growth data, which have been obtained on various research programs are included. Cyclic lives, times to failure and flaw growth rates are discussed in the context of linear elastic crack tip stress intensity factors. It is shown how the proof test is used to provide assurance of subsequent service life for both thick and thin walled vessels, and test procedures are recommended which should minimize potential damaging effects of the test which can occur as a result of flaw growth. Author

N74-23431 National Engineering Lab., East Kilbride (Scotland).
AN EXAMPLE OF A METHOD FOR PREDICTING FAILURE
G. H. Haslam *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 314-324 refs (For availability see N74-23413 14-32)

A method is presented for estimating the life to failure of a cylindrical pressure vessel subjected to repeated internal pressure. Design curves are obtained by which the fatigue life of such a cylinder may be estimated from a knowledge of the transverse uniaxial fatigue limit and fracture roughness properties of the cylinder material, as well as the diameter ratio of the cylinder and the repeated pressure. Examples are given of the application of the method and close correlation is demonstrated between estimated and actual behaviour. Author

N74-23432 Societe Nationale Industrielle Aerospatiale, Paris (France).
SERVICE FAILURES AND LABORATORY TESTS
W. Barrois *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 325-345 refs (For availability see N74-23413 14-32)

The significant differences between structural analyses conducted in the laboratory and those conducted under service conditions are compared. Low temperature brittleness and hydrogen embrittlement of steels are used as examples. Intergranular or stress corrosion of aluminum alloys are reviewed in relation to various causes of service or manufacturing damages. The main objectives of structural tests are defined. Curves are developed to show the fracture toughness of steel sheets as a function of treatment and test temperature. Photographic samples of specific types of structural failure are included. Author

N74-23433 Societe Nationale Industrielle Aerospatiale, Paris (France).
A SHORT SURVEY ON POSSIBILITIES OF FATIGUE LIFE ASSESSMENT OF AIRCRAFT STRUCTURES BASED ON RANDOM OR PROGRAMMED FATIGUE TESTS
W. Barrois *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 346-366 refs Repr. from AGARD Conf. Proc. No. 118 (For availability see N74-23413 14-32)

The various physical parameters which are significant in the fatigue behavior of specimens and structures are reviewed. Several types of fatigue tests are analyzed to show their applicability. A short survey is made of present prediction methods of structure fatigue life from fatigue tests of components, assemblies, and structures undergoing constant amplitude loadings. The case of random loadings is also discussed. The possibility of test acceleration by increasing general loading itensity is considered. Author

N74-23434 Technische Hogeschool, Delft (Netherlands).
OUTLOOK, FUTURE DEVELOPMENTS
David Broek *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 367-369 (For availability see N74-23413 14-32)

The factors which influence the design of fail-safe systems are discussed. It is stated that many of the shortcomings in fail-safe design are caused by insufficient knowledge of fracture and fatigue mechanisms. For successful fail-safe operation, the results of tests should be documented with respect to critical locations, crack propagation rates, and residual strength. The procedures for conducting tests which will provide the data required for fail-safe design are defined. Author

N74-23435 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).

EXPERIMENTAL TECHNIQUES FOR DETERMINING FRACTURE TOUGHNESS VALUES

Walter Schuetz and Wolfram Oberparleiter *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 371-394 refs (For availability see N74-23413 14-32)

The Standard Method of Test for Plane Strain Fracture Toughness of Metallic Materials and the Standard Method of Sharp Notch Tension Testing of High Strength Sheet Materials, are described and some details which are important for carrying out the test are discussed. A series of nonstandard test methods are explained which mainly use different specimen shapes. Advantages and disadvantages of these test methods are discussed and comparisons of the test results with results obtained from the ASTM standard specimen are made. Also test equipment for testing fracture toughness of weldments, under environmental conditions (low temperature, salt water corrosion) and high strain rates are described. Author

N74-23436 Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).

RELIABILITY OF THE DETECTION OF FLAWS AND OF THE DETERMINATION OF FLAW SIZE

Ekkart Knorr *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 395-412 refs (For availability see N74-23413 14-32)

Laboratory investigations concerning reliability of crack detection and determination of crack size which represent the state of the art are described. All three are typical applications of nondestructive inspection to structural parts of aircraft: (1) inspection of flat surfaces with fatigue cracks, using ultrasonic, X-ray, dye penetrant, magnetic particle and eddy current methods, (2) crack detection below rivet heads with an ultrasonic shear wave technique, and (3) crack detection in bore holes of a forged part using a manual eddy current method. The second and the third one analyzed for statistical evaluation of probability of success. An evaluation of the conventional NDI-methods regarding reliability is performed. Author

N74-23437 Aeritalia, Turin (Italy).

NONDESTRUCTIVE TESTING (NDT) AND FRACTURE MECHANICS

Enrico Bolis *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 413-417 refs (For availability see N74-23413 14-32)

The basic concepts of nondestructive testing (NDT) are reviewed in relationship with fracture mechanics concepts. The necessity of correlating basic differences between ordinary destructive mechanical tests and NDT is considered. The use of NDT for assessment of integrity of aircraft components and structures, after fabrication and during service life is discussed. Inherent limitations of NDT and necessity of interdepartmental team work are reviewed. General information on routine and advanced methods is included. Author

N74-23438 Aerojet Solid Propulsion Co., Sacramento, Calif.

DETECTION AND DETERMINATION OF FLAW SIZE BY ACOUSTIC EMISSION

C. E. Hartbower *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 419-473 refs (For availability see N74-23413 14-32)

Available acoustic emission instrumentation systems are so sensitive that it is possible to detect each stage of the failure process starting with deformation (dislocation pileups), crack propagation and, finally, the onset of instability all in real time. In the second and third stage of the failure process, it is possible by triangulation to locate the source of the signal. In some applications, the practical limitation for use of acoustic emission as a nondestructive inspection method has been and will continue to be extraneous noise. However, most noise problems are solved by the effective use of band-pass filters or special isolation techniques involving computer solutions. The use of acoustic emission as a nondestructive inspection technique has been under development for over a decade. The technique is based upon the elastic energy which is spontaneously released when a material undergoes plastic deformation and/or cracking. Thus, acoustic emission constitutes a unique nondestructive inspection method in that the material defect when propagating, transmits its own signal, with the sensor acting as the receiver. The material undergoing crack growth both generates and transmits the signal (acoustic emission) which then can be detected by suitable instrumentation and the source located using seismic techniques. Author

N74-23439 Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).

SURFACE DYE PENETRANTS

Wolfgang Hansen *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 474-484 refs (For availability see N74-23413 14-32)

The detection of surface cracks in metal sheets using a penetrant dye technique is discussed. The preparation of the specimen for inspection is described. The subjects covered include the following: (1) applicability and limitations of the process, (2) intensifying the sensitivity of the dye, (3) the difference between red and fluorescent penetrants and (4) qualification of inspection materials. Author

N74-23440 Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).

MAGNETIC PARTICLE TESTING c23

Eberhard Dickhaut *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 485-493 refs (For availability see N74-23413 14-32)

Nondestructive tests of ferritic materials using magnetic particle techniques are described. The magnetizing methods are discussed. Illustrations of the various methods are provided. The procedure for preparing the specimen for testing is reported. Comments concerning the application and usefulness of the process are included. Author

N74-23441 Dornier-System G.m.b.H., Friedrichshafen (West Germany).

FLAW DETECTION BY MEANS OF HOLOGRAPHIC INTERFEROMETRY c16

Klaus Gruenewald *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 494-502 refs (For availability see N74-23413 14-32)

Nondestructive tests to detect flaws using holographic interferometry techniques are discussed. Descriptions of the optical measuring principles of holography are provided. The theoretical and experimental aspects of holographic interferometry are examined. References are made with respect to quantitative interpretation of interferograms. The possibilities of flaw detection are illustrated by some experimental examples. Author

N74-23442 Royal Aircraft Establishment, Farnborough (England).

AN ANALYSIS OF A TEST FATIGUE FAILURE BY FRACTOGRAPHY AND FRACTURE MECHANICS

C. J. Peel *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 503-508 refs (For availability see N74-23413 14-32)

The fracture surfaces of two fatigue cracks, that had caused the failure of an engine impeller during a fatigue substantiation test, were examined by electron microscopy to find the number of fatigue crack growth cycles. This was done by measuring the spacings of fatigue striations on the fracture surface as a function of crack depth and by subsequent integration of the striation spacing versus crack depth expression. The measured striation spacings were compared with laboratory crack growth data to determine the fatigue stress intensity range as a function of crack depth and hence the fatigue stress range. The number of crack initiation cycles was then found by comparing the fatigue stress range and number of crack growth cycles with further laboratory data and the total fatigue life was calculated to have been approximately 50,000 cycles. This identified the fatigue loading that had caused the failure as having been the 29179 cycles of engine acceleration and deceleration that had been applied during the test. Author

N74-23443 Army Materials and Mechanics Research Center, Watertown, Mass.

TYPICAL PLANE STRAIN FRACTURE TOUGHNESS OF AIRCRAFT MATERIALS

W. T. Matthews *In* AGARD Fracture Mechanics of Aircraft Structure Jan. 1974 p 509-579 refs (For availability see N74-23413 14-32)

The fracture toughness values of aircraft metals are expressed in terms of linear elastic fracture mechanics. The general tabulation includes only values measured under plane strain conditions. These plane strain K sub IC values have been obtained by the ASTM E399-72 Standard Method of Test for Plane Strain Fracture Toughness Testing of Metallic Material or a similar method. This data compilation includes materials manufactured in the U.S.A. and Europe. Factors involved in the selection and interpretation of the K sub IC values will be discussed in the latter sections of this introduction. Author

N74-23444 Royal Aircraft Establishment, Farnborough (England).

FRACTURE TOUGHNESS TEST RESULTS

W. T. Kirkby *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 580-591 refs (For availability see N74-23413 14-32)

Fracture toughness test results for various metal alloys and compounds are tabulated. Data for titanium alloys, steels, and aluminum alloys have been collated. The composition of the alloys, their form, and the fracture plane orientation of the fracture toughness test pieces are given. Tensile test results for the various heat treatments are included. The results have been obtained from room temperature tests. Author

N74-23445 Royal Aircraft Establishment, Farnborough (England).

STRESS INTENSITY FACTOR SOLUTIONS

D. P. Rooke and D. J. Cartwright (Southampton Univ.) *In* AGARD Fracture Mechanics of Aircraft Structures Jan. 1974 p 592-600 refs (For availability see N74-23413 14-32)

The titles and references of approximately 140 configurations for which stress intensity factors have been determined, are presented. Section 1 gives the titles of the various configurations together with reference numbers, which are detailed in section 2. The solutions are given in graphical form together with relevant formulas. Author

N74-23446# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.

A HIGH PRECISION EXPERIMENT OF THE BUCKLING OF SPHERICAL CAPS SUBJECTED TO EXTERNAL PRESSURE

Megumi Sunakawa and Kazuo Ichida Mar. 1974 36 p refs (ISAS-508-Vol-39-No-5) Avail: NTIS HC $5.00

A high precision experiment has been carried out to bridge the gap between the theoretical and experimental buckling loads of spherical caps subjected to external pressure. The details of the forming process of test specimens, experimental arrangements and procedures, and reliable data on the buckling load as well as the deflection and strain distributions obtained are reported. It is shown that the buckling load of perfect spherical caps is close to the so-called classical value, the pre- and postbuckling deformation patterns are axisymmetrical. Prebuckling deformation patterns are not fixed but change through the loading and are subject to the geometrical parameter. The number of waves in the meridional direction increases and the so-called boundary layer is formed as the geometrical parameter becomes larger. The membrane state of strains is predominant and load vs. deflection curves are almost linear for large values of the geometrical parameter in the prebuckling state of equilibrium. The deflection of shells is small up to the occurrence of buckling, and hence the small deflection theory will play still an important role in analyzing the stability of spherical caps subjected to external pressure. Author

N74-23447# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.

HYDRODYNAMIC IMPACT OF FLEXIBLE SPHERICAL SHELLS

Yoichi Hirano Sep. 1973 29 p refs (ISAS-499-Vol-38-No-10) Avail: NTIS HC $4.50

Water impact accelerations of flexible spherical shells are analyzed considering hydroelastic interactions between water and vibrations of bottom surfaces. Four equations are derived to express the phenomena and solved numerically. Experiments were carried out with the models whose bottoms were flexible spherical shells. The experimental results are compared with the analytical results and fair agreements are observed. Author

N74-23448*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EXPERIMENTAL AND ANALYTICAL DETERMINATION OF VIBRATION CHARACTERISTICS OF CORRUGATED, FLEXIBLY SUPPORTED, HEAT-SHIELD PANELS

Huey D. Carden Washington May 1974 24 p refs (NASA-TN-D-7562; L-9364) Avail: NTIS HC $3.00 CSCL 20K

Experimental and analytical natural frequencies, nodal patterns, and typical modal displacements for a corrugated, flexibly supported, heat-shield panel are discussed. Good correlation was found between the experimental data and NASTRAN analytical results for the corrugated panel over a relatively wide frequency spectrum covered in the investigation. Of the two experimental techniques used for mode shape and displacement measurements (a noncontacting displacement sensor system and a holographic technique using a helium-neon, continuous-wave laser), the holographic technique was found, in the present investigation, to be faster and better suited for determining a large number of complex nodal patterns of the corrugated panel. Author

N74-23449*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

TECHNIQUE FOR BONDING Patent Application

Marvin B. Dow, Howard G. Bush, William M. Haraway, Jr., and John F. Crumpler, inventors (to NASA) Filed 24 Jan. 1974 14 p (NASA-Case-LAR-10073-1; US-Patent-Appl-SN-436317) Avail: NTIS HC $4.00 CSCL 11D

A method for molding a silicone elastomer into a fiberglass honeycomb panel previously bonded to a face sheet panel, is presented. The elastomer is introduced into a mold under vacuum to prevent air entrapment, and the bonded honeycomb panel is positioned above the elastomer filled mold and forced into the elastomer for vacuum filling the honeycomb structure. NASA

N74-23450*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

TRANSIENT RESPONSE OF SHELLS OF REVOLUTION BY DIRECT INTEGRATION AND MODAL SUPERPOSITION METHODS

Wendell B. Stephens and Howard M. Adelman Washington May 1974 53 p refs (NASA-TM-X-2916; L-9216) Avail: NTIS HC $3.75 CSCL 20K

The results of an analytical effort to obtain and evaluate transient response data for a cylindrical and a conical shell by use of two different approaches: direct integration and modal superposition are described. The inclusion of nonlinear terms is more important than the inclusion of secondary linear effects (transverse shear deformation and rotary inertia) although there are thin-shell structures where these secondary effects are important. The advantages of the direct integration approach are that geometric nonlinear and secondary effects are easy to include and high-frequency response may be calculated. In comparison to the modal superposition technique the computer storage requirements are smaller. The advantages of the modal superposition approach are that the solution is independent of the previous time history and that once the modal data are obtained, the response for repeated cases may be efficiently computed. Also, any admissible set of initial conditions can be applied. Author

N74-23451*# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.

SMALL SCALE YIELDING ANALYSIS OF MIXED MODE PLANE STRAIN CRACK PROBLEMS

C. F. Shih [1973] 37 p refs (Grants NGL-22-007-012; AF-AFOSR-2476-73)

(NASA-CR-138246; DEAP-S-1) Avail: NTIS HC $5.00 CSCL 20K

The small scale yielding analysis of an elastic-plastic body with a line crack under plane strain conditions subject to combinations of Mode I and II loadings is examined. The analysis of the near-tip field follows the works of Hutchinson and Rice and Rosengren. Dominant singularity solutions governing the asymptotic behavior of the stresses and strains at the crack tip are obtained for the complete range of loadings between Mode I and II. The results of an accurate finite element technique, which imbeds the dominant singularity solutions, directly relates the near-tip behavior to the elastic stress intensity factors. Implications of this study to mixed mode fracture mechanics are also discussed, particularly with respect to the direction of crack initiation and the relation of fracture toughness under mixed modes to that in Mode I. Details of the mixed mode plastic zone sizes and shapes are also given. Author

N74-23452*# Kanner (Leo) Associates, Redwood City, Calif.
TEMPERATURE FIELDS IN PROFILE SAMPLES DURING THERMAL FATIGUE TESTING
D. F. Simbirskiy, A. V. Oleynik, and A. Ya. Anikin Washington NASA May 1974 16 p refs Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 23, 1970 p 16-24
(Contract NASw-2481)
(NASA-TT-F-15642) Avail: NTIS HC $4.00 CSCL 20K

An engineering method of determining nonstationary temperature fields in the cross sections of such profiles as turbine blades under conditions of thermal fatigue is proposed. The method is based on the precise determination of the surface temperature by means of thin-film thermocouples which are characterized by a negligible rise time and which do not distort the temperature field of a sample or the aerodynamics of the flow about it. Author

N74-23453# Asian Inst. of Tech., Bangkok (Thailand).
ULTIMATE STRENGTH OF WIDE FLANGE AND BOX COLUMNS
Fumio Nishino, Tokul Kanchanalai (Dept. of Highways, Bangkok), and Seng Lip Lee Sep. 1972 31 p refs
(RR-29) Avail: NTIS HC $4.75

The ultimate strength of elastic-plastic steel wide-flange columns subjected to axial load and symmetrical end bending moments was investigated. The presence of residual stresses arising from fabrication processes leads to moment-thrust-curvature relationships which are untractable analytically. The latter is determined numerically. The integration procedure employs a numerical marching technique. The results are presented in the form of critical load-slenderness ratio relationship obtained for the welding-type and cooling-type (parabolic) patterns of residual stress distribution. The effects of initial curvature on the strength of the columns are also compared with straight columns. Author

N74-23454# National Aerospace Lab., Tokyo (Japan).
STRAIN ANALYSIS BY THE MOIRE ANALYZER METHOD (ON THE ACCURACY IN MEASUREMENT AND HEAT PROOF MOIRE GRID)
Yoshio Aoki Sep. 1973 16 p refs In JAPANESE; ENGLISH summary
(NAL-TR-336) Avail: NTIS HC $4.00

A heat proof grid of 1000 lines per inch was etched on steel and on aluminum alloy by using the technique of resist grid production. It is found that this moire grid could endure up to 500 C. A moire analyzer with variable mismatch and rotational mismatch was made. The effect of errors, which was introduced in the measurements of fringe pitch and the direction of the fringe pattern, on the strain value is discussed, and compared with values obtained by wire strain gage method. The elastoplastic strain concentration factors of aluminum alloy strips with a central circular hole at room temperature were obtained using the developed grid. Author

N74-23455# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
BY VARIABLE SERVICE LOAD PRODUCED RESIDUAL STRESSES IN NOTCHES AND THEIR IMPORTANCE FOR APPLICATION TO THE LINEAR DAMAGE ACCUMULATION HYPOTHESIS: TEXT [DURCH VERAENDERLICHE BETRIEBSLASTEN IN KERBEN ERZEUGTE EIGENSPANNUNGEN UND IHRE BEDEUTUNG FUER DIE ANWENDBARKEIT DER LINEAREN SCHADENSAKKUMULATIONS-HYPOTHESE]
D. Schuetz 1972 56 p refs In GERMAN
(FB-100(1972)) Avail: NTIS HC $6.00

The unreliable nature of the linear damage accumulation hypothesis for providing valid service life estimates is explained. The development of an improved method is discussed. The method is based on determining the residual stresses at the notch root of open hole specimens of aluminum alloys. The residual stresses are continuously measured during the macro-crack-free life range. The residual stress history provided by these measurements made it possible to define a corrected hypothesis. Author

N74-23456# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
BY VARIABLE SERVICE LOAD PRODUCED RESIDUAL STRESSES IN NOTCHES AND THEIR IMPORTANCE FOR APPLICATION TO THE LINEAR ACCUMULATION HYPOTHESIS: PICTURES [DURCH VERAENDERLICHE BETRIEBSLASTEN IN KERBEN ERZEUGTE EIGENSPANNUNGEN UND IHRE BEDEUTUNG FUER DIE ANWENDBARKEIT DER LINEAREN SCHADENSAKKUMULATIONS-HYPOTHESE]
D. Schuet 1972 20 p In GERMAN
(FB-100(1972)) Avail: NTIS HC $4.00

For abstract, see N74-23455.

N74-23457# Technische Hochschule, Aachen (West Germany). Lab. fuer Ultraschall.
INVESTIGATIONS ON THE POSSIBILITY OF INITIATING BRITTLE FRACTURES BY ULTRASOUND [UNTERSUCHUNGEN UEBER DIE MOEGLICHKEIT DER EINLEITUNG VON SPROEDBRUECHEN DURCH ULTRASCHALL]
R. Pohlman and B. Werden Dec. 1973 22 p refs In GERMAN
Avail: NTIS HC $4.25

The use of ultrasound for fracturing glass plates after being notched was investigated. Ultrasonic hammering was successful for thin glass plates only. For thick plates a coupling medium such as mineral oil or silicone oil was necessary. The negative exponential nozzle was found to be the most effective ultrasound transmitter. The method was elaborated to produce 150-300 mm long fractures in glass plates of 10-22 mm thickness. ESRO

N74-23458# Institut fuer Festkoerpermechanik, Freiburg (West Germany).
MEASUREMENT OF THE FRACTURE TOUGHNESS OF WELDED JOINTS AND THERMALLY SIMULATED STRUCTURES OF A MARAGING STEEL [MESSUNG DER RISSZAEHIGKEIT AN SCHWEISSVERBINDUNGEN UND THERMISCH SIMULIERTEN GEFUEGEN AUS EINEM MARTENSITAUSHAERTBAREN STAHL]
Johann Georg Blauel, Harold R. Smith, and Guenter Schulze (Schweisstech. Lehr-und Versuchsanstalt, Berlin) Apr. 1973 103 p refs In GERMAN; ENGLISH summary
(Rept-4/73) Avail: NTIS HC $8.25

The strength and toughness of welded joints of the high strength maraging steel, X2 Ni Co Mo (18-9-5) were determined. For this, 3-point-bend-specimens were taken from 6 pass TIG welded joints in 10 mm thick plates. Fatigue cracks were carefully located in the base material and the different structures of the heat-affected-zone. Fracture mechanics testing was then carried out according to the ASTM recommendations. The results obtained in this way were compared with measurements on simulated structures. Data are also given on the metallurgical parameters which determine fracture toughness. Author (ESRO)

N74-23459# Colorado Univ., Boulder. Dept. of Mechanical Engineering.
WAVE PROPAGATION IN SOLID BODIES Final Report, Apr. 1970 - Nov. 1973
S. K. Datta and W. E. Jahsman Nov. 1973 12 p refs
(Grant NSF GK-10872)
(PB-225937/2; CUMER-73-3) Avail: NTIS HC $3.00 CSCL

20L

Substantial advances were made in the analysis of elastic wave diffraction at inclusions of various shapes and impedances and in the combined analytical and experimental investigations of wave transmission through inelastic bodies. In the elastic wave diffraction area three fairly efficient methods have been found that can be used to solve the problem of wave scattering by arbitrary rigid bodies. It is seen that these can also be extended to analyze the scattering by cavities or elastic inclusions. In the inelastic wave transmission area, the Kolsky apparatus has been modified to provide experimental data on dynamic material behavior under nearly uniaxial strain conditions. Supporting data reduction techniques exploiting the singular surface approach have also been developed. GRA

N74-23460# Sydney Univ. (Australia). Civil Engineering Labs.
MATRIX FORCE ANALYSIS OF TORSION IN THIN-WALLED STRUCTURES
Gregory J. Hancock Jul. 1973 42 p refs
(PB-226050/3; R-222) Avail: NTIS HC $4.25 CSCL 13M

The matrix force method is applied to the torsional analysis of thin-walled beams. The method is presented as an extension of the original work by Krajcinovic so that a wider range of problems can be solved than was originally possible. In order to use the matrix force method of analysis, the structure must be released at several points to produce a statically determinate structural system. Statical determinacy of a structure usually implies that the internal actions can be calculated from the applied loads using only equations or equilibrium. However, for structures composed of thin-walled members, the differential equation describing the torsional behavior must be used to determine the internal actions. (Modified author abstract) GRA

N74-23461# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
LARGE AMPLITUDE WAVES IN BOUNDED MEDIA. 3: THE DEFORMATION OF AN IMPULSIVELY LOADED SLAB (THE SECOND REFLECTION)
J. Y. Kazakia and E. Varley Feb. 1974 22 p
(Contract DAAD05-71-C-0389)
(AD-775852; CAM-140-5; BRL-CR-136) Avail: NTIS CSCL 20/11

Representations are derived that describe the interactions of the waves that are reflected from both perfectly rigid and perfectly free interfaces during the arrival of a centered wave with any wave traveling in the opposite direction. These are used to analyze the early stages of the deformation produced when the traction at the loaded boundary continues to vary after changing discontinuously. Author (GRA)

N74-23462# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
AN EXPERIMENTAL OPTIMIZATION STUDY OF THE STABILITY OF THIN SHELLS HAVING VARIOUS MERIDIONAL CONTOURS
R. L. Sendelbeck and N. J. Hoff Nov. 1973 35 p refs
(Contract F44620-69-C-0009; AF Proj. 9782)
(AD-776081; SU-SUDAAR-468; AFOSR-74-0247TR) Avail: NTIS CSCL 20/11

It is well known that the buckling stress of flat rectangular plates subjected to compression in the longitudinal direction can be increased through the application of tension in the transverse direction. The purpose of the present investigation is to find out whether a similar effect exists in the case of circular cylindrical shells. It has also been known that the application of internal pressure has a stabilizing effect on axially compressed circular cylindrical shells. However, this effect is less strong than the one mentioned in connection with the flat plate; it does not increase the experimental buckling stress above the classical theoretical value, it only eliminates the deletorious effect of initial inaccuracies in the manufacture of the shell. These inaccuracies very often reduce the experimental buckling stress to 25 to 50 percent of the theoretical value. (Modified author abstract) GRA

N74-23463# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
SUMMARY OF RESEARCH ON THE VIBRATION OF ELASTIC STRUCTURES
Lawrence W. Rehfield Feb. 1974 13 p refs
(Grant AF-AFOSR-2479-73; AF Proj. 9782)
(AD-776016; AFOSR-74-0363TR; GIT-AER-SM-2) Avail: NTIS CSCL 20/11

The report contains a brief summary of research on linear and nonlinear effects in the vibration of elastic structures. The studies include an investigation of boundary restraint effects on the vibration of curved cylindrical panels using linear theory and the development and application of a general theory for nonlinear, undamped, large amplitude free and forced vibration of elastic structures. The general theory includes the effect of nonlinear elastic constitutive relations, which has been shown to be important for a number of conventional metallic aerospace materials. A listing of reports and publications that have resulted from the research is included. Author (GRA)

N74-23464# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
AN EXPERIMENTAL INVESTIGATION OF THE NONLINEAR VIBRATION OF CYLINDRICAL SHELLS Final Report
Frank Kendall, III Oct. 1973 76 p refs
(Grant AF-AFOSR-2447-73; AF Proj. 6813)
(AD-776007; Galcit-SM-73-7; AFOSR-74-0302TR) Avail: NTIS CSCL 13/13

An experimental investigation of the nonlinear vibrations of cylindrical shells was undertaken. An aluminum shell was vibrated by means of an induction shaker. An optical device was used to obtain radial displacement measurements. Several modes of vibration were studied in detail. Various nonlinear effects were observed. These included nonlinearity in the driven mode frequency response curve, the participation of the companion mode, and the participation of axisymmetric response at twice the driven frequency. The experimental results indicated only a softening type nonlinearity. The response of the companion mode was significant in several of the modes studied and was of a more complex nature than was predicted by previous theoretical work. Author (GRA)

N74-22668* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CURRENT STRUCTURAL VIBRATION PROBLEMS ASSOCIATED WITH NOISE
John S. Mixson *In* AGARD Noise Mech. Mar. 1974 16 p refs (For availability see N74-22640 14-02)

N74-23518 European Space Research Organization, Paris (France).
MATRIX ANALYSIS OF MULTILAYER AND SANDWICH SHELLS BY THE FINITE ELEMENT METHOD
Daniel Engrand (ONERA, Paris) et al *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 119-141 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 109-118 (For availability see N74-23512 14-34)

N74-23519 European Space Research Organization, Paris (France).
OPTIMIZATION OF A VIBRATION GENERATOR IN CONDITIONS OF EXTERNAL EXCITATION
Jean Francois Boisseau (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 142-145 ref Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 119-120 (For availability see N74-23512 14-34)

N74-23520 European Space Research Organization, Paris (France).
APPARATUS FOR THE QUALIFICATION OF VERY LOW FREQUENCY VIBRATION EXCITERS
Jean Francois Boisseau (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 146-155 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 120-122 (For availability see N74-23512 14-34)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-23465 Wisconsin Univ., Madison.
AN INVESTIGATION OF THE DIFFUSION FLAME SURROUNDING A SIMULATED LIQUID FUEL DROPLET Ph.D. Thesis
Said Ibrahim Abdel-Khalik 1973 301 p
Avail: Univ. Microfilms Order No. 73-28314

The structure of the boundary layer around a n-heptane wetted cylinder, burning steadily at atmospheric pressure in a uniform air flow field, was investigated by means of gas chromatography and optical interferometry. Two different size cylinders were examined while burning at three air velocities. The air velocity was kept below the extinction value so that an envelope flame was always established around the cylinder. Samples were withdrawn from the flame at points along the 0, 45, 90, 135, and 180 deg radial lines (measured from the forward stagnation line) by means of quartz microprobes. The samples were analyzed using a gas chromatograph. The analysis yielded concentrations of CO_2, CO, O_2, N_2, C_2H_2, C_2H_4, and C_7H_{16} in dried samples. The water vapor concentration was obtained with the help of the experimental data. The composition profiles were used to calculate the molar refractivity distributions necessary to analyze the interferograms. Dissert. Abstr.

N74-23466 Massachusetts Univ., Boston.
A THEORETICAL STUDY DETERMINING THE EFFECT OF VARIOUS OPERATING CONDITIONS ON THE EMISSIONS FROM A TWO STAGE RANKINE CYCLE BURNER Ph.D. Thesis
John Worthen Sanborn 1973 164 p
Avail: Univ. Microfilms Order No. 74-8628

A theoretical investigation in respect to the effects of initial and final equivalence ratio, swirl intensity, and primary air mass flow rate on harmful pollutants from a two stage methane - air Rankine cycle burner with heat transfer is reported. Convective and radiative heat transfer from the flame and the gases to the surrounding burner walls were considered to aid in the simultaneous reduction of oxides of nitrogen and carbon monoxide. The first stage was operated at fuel rich condition to reduce the amount of oxides of nitrogen formed and air was added to the second stage to oxidize the unburnt hydrocarbons and carbon monoxide. The Rankine burner was modeled as five well stirred reactors in parallel for the first stage and five well stirred reactors in series for the second stage. The combustion process consisted of a twenty-two step kinetic reaction mechanism including fifteen species. Dissert. Abstr.

N74-23467+ Toulouse Univ. (France). Lab. de Genie Electrique.
DIELECTRIC PROPERTIES OF EXPLOSIVES. APPLICATION TO START-UP [ETUDE DES PROPRIETES DIELECTRIQUES DES EXPLOSIFS. APPLICATIONS A L'AMORCAGE. RAPPORTS 1 ET 2]
Bui Ai and R. Dalbes 18 Oct. 1973 6 p ref In FRENCH
(Publ-218) Avail: NTIS HC $4.00

In order to study the arc formation of explosive submitted to an electric field, some characteristic parameters were studied. The methodology and instrumentation used are presented with regard to electric conductivity, thermal conductivity, and specific heat. ESRO

N74-23468*# Techtran Corp., Glen Burnie, Md.
A TRANSIENT PROCESS DURING THE COMBUSTION OF A CONDENSED MATERIAL
Yu. I. Babenko Washington NASA May 1974 8 p refs
Transl. into ENGLISH from Fiz. Goreniya Vzryva (Novosibirsk), v. 9, no. 4, Jul.-Aug. 1973 p 596-598
(Contract NASw-2485)
(NASA-TT-F-15633) Avail: NTIS HC $4.00 CSCL 21B

An unsteady process arising during and abrupt increase in pressure during the combustion of a condensed material is considered, and an analytical method of determining the unsteady burning velocity during such a pressure change is outlined. The proposed method is based on the use of fractional differentiation operators and on certain rules deriving from the properties of fractional differentiation. An example is cited in which the proposed analytical method is more convenient to use than a numerical method for relatively small pressure differentials, since it makes it possible to construct a solution in a larger time interval. Author

N74-23469# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
A PRELIMINARY STUDY OF SUPERSONIC COMBUSTION IN A VITIATED AIRSTREAM USING TRANSVERSE INJECTION
Hiroshi Tsuji, Tadao Takeno, and Akira Yoshida Mar. 1974 18 p refs
(ISAS-510-Vol-39-No-7) Avail: NTIS HC $4.00

An experimental investigation was conducted on the combustion of gaseous fuels injected normal to a supersonic airstream. City gas, ethylene and methane were injected transversely at sonic velocity from a circular injector in a flat plate (simulating the combustion chamber wall of a scramjet engine) into a Mach 1.10 vitiated airstream at an air total temperature of 1700 K and total pressure of about 2 atmospheres. Photographic observations of the flame shape were made to compare the edge of the luminous flame zone with the nonreacting jet penetration. The total pressure and the temperature surveys were made to examine the complex combustion flow field in the vertical and horizontal planes. As a result of the investigation, it was found that the edge of the luminous flame zone was correlated well with the nonreacting jet penetration. There was a relatively large recirculation region immediately downstream of the fuel jet, and the supersonic flow field with fuel injection was influenced only a little by the heat release. Author

N74-23470# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
TRANSPORT PROPERTIES OF BURNED GAS MIXTURE
Taeko Sano Jan. 1974 21 p refs
(ISAS-504-VOL-39-NO-1) Avail: NTIS HC $4.25

The transport properties of viscosity coefficient, thermal conductivity and multidiffusion coefficient of the burned gas mixtures of n-octane by air are calculated by the approximate equations to the kinetic theory equations for the multicomponent gas mixtures. By using the values of collision diameter of molecular species obtained from the experimental data of viscosity of molecular species and expressed as a function of temperature, the transport properties of molecular species are calculated on the basis of the rigid-sphere potential in the molecular kinetic theory to be in good agreement with the experimental data. Although the accuracy of the calculated values of atomic and radical species can not be verified, the transport properties of burned gas mixtures are not affected by their unreliable values because of small mole fractions of atomic and radical species. Author

N74-23471*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BURNING OF SOLIDS IN OXYGEN-RICH ENVIRONMENTS IN NORMAL AND REDUCED GRAVITY
Charles R. Andracchio and Thomas H. Cochran Washington May 1974 22 p refs
(NASA-TM-X-3055; E-7848) Avail: NTIS HC $3.00 CSCL 20M

An experimental program was conducted to investigate the combustion characteristics of solids burning in a weightless environment. The combustion characteristics of thin cellulose acetate material were obtained from specimens burned in supercritical as well as in low pressure oxygen atmospheres. Flame spread rates were measured and found to depend on material thickness and pressure in both normal gravity (1-g) and reduced gravity (0-g). A gravity effect on the burning process was also observed; the ratio of 1-g to 0-g flame spread rate becomes larger with increasing material thickness. Qualitative results on the combustion characteristics of metal screens (stainless steel, Inconel, copper, and aluminum) burning in supercritical oxygen and normal gravity are also presented. Stainless steel (300 sq mesh) was successfully ignited in reduced gravity; no apparent difference in the flame spread pattern was observed between 1-g and 0-g. Author

N74-23472*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

PERFORMANCE OF LI-1542 REUSABLE SURFACE INSULATION SYSTEM IN A HYPERSONIC STREAM

L. Roane Hunt and Herman L. Bohon Apr. 1974 57 p refs
(NASA-TM-X-71955) Avail: NTIS HC $3.75 CSCL 20M

The thermal and structural performance of a large panel of LI-1542 reusable surface insulation tiles was determined by a series of cyclic heating tests using radiant lamps and aerothemal tests in the Langley 8-foot high-temperature structures tunnel. Aerothermal tests were conducted at a free-stream Mach number of 6.6, a total temperature of 1830 K, Reynolds numbers of 2.0 and 4,900,000 per meter, and dynamic pressures of 29 and 65 kPa. The results suggest that pressure gradients in gaps and flow impingement on the header walls at the end of longitudinal gaps are sources for increased gap heating. Temperatures higher than surface radiation equilibrium temperature were measured deep in gaps and at the header walls. Also, the damage tolerance of the LI-1542 tiles appears to be very high. Tile edge erosion rate was slow; could not be tolerated in a shuttle application. Tiles soaked with water and subjected to rapid depressurization and aerodynamic heating showed no visible evidence of damage. Author

N74-23473*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AN EXPERIMENTAL INVESTIGATION OF JET PLUME SIMULATION WITH SOLID CIRCULAR CYLINDERS

David E. Reubush May 1974 98 p refs
(NASA-TM-X-71963) Avail: NTIS HC $8.00 CSCL 21B

An investigation has been conducted in the Langley 16-foot transonic tunnel to determine the effectiveness of utilizing solid circular cylinders to simulate the jet exhaust plume for a series of four isolated circular arc afterbodies with little or no flow separation. This investigation was conducted at Mach numbers from 0.40 to 1.30 at 0 deg angle of attack. Plume simulators with simulator diameter to nozzle exit diameter ratios of 0.82, 0.88, 0.98, and 1.00 were investigated with one of the four configurations while the 0.82 and 1.00 simulators were investigated with the other three. Reynolds number based on maximum model diameter varied from approximately 1.50 to 2.14 million. Author

N74-23474*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EFFECT OF DIFFUSER BLEED ON PERFORMANCE OF AN ANNULAR SWIRL CAN COMBUSTOR

Albert J. Juhasz Washington May 1974 24 p refs
(NASA-TM-X-3056; E-7854) Avail: NTIS HC $3.00 CSCL 20M

A full-scale annular swirl can combustor equipped with diffuser bleed capability was tested at low fuel-air ratio, burning natural gas fuel. Test results show that, by drawing off a small amount of air on the inner or outer diffuser wall, the radial profile of combustor exit temperature could be changed from a strongly tip biased, to a strongly hub biased shape. Furthermore, combustor total pressure loss could be reduced by about one third by using a total bleed rate equal to 6 percent of diffuser inlet flow. At simulated engine idle conditions combustion efficiency was increased from 64 percent to nearly 100 percent by using 3 percent outer wall bleed. Combustor blowout performance was also improved significantly by using this diffuser bleed scheme. Author

N74-23475*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

EXPLOSIVE PROPULSION APPLICATIONS

Y. Nakamura, G. Varsi, and L. H. Back 1 Apr. 1974 60 p refs
(Contract NAS7-100)
(NASA-CR-138454; JPL-TM-33-675) Avail: NTIS HC $6.00 CSCL 19A

The feasibility and application of an explosive propulsion concept capable of supporting future unmanned missions in the post-1980 era were examined and recommendations made for advanced technology development tasks. The Venus large lander mission was selected as the first in which the explosive propulsion concept can find application. A conceptual design was generated and its performance, weight, costs, and interaction effects determined. Comparisons were made with conventional propulsion alternatives. The feasibility of the explosive propulsion system was verified for planetology experiments within the dense atmosphere of Venus as well as the outer planets. Additionally, it was determined that the Venus large lander mission could be augmented ballistically with a significant delivery margin. Author

N74-23476# United Aircraft Corp., East Hartford, Conn. Research Labs.

DEVELOPMENT OF A COMBUSTOR FLOW ANALYSIS. PART 2: EXPERIMENTAL STUDIES Final Report, 1 Jun. - 30 Sep. 1973

Robert F. Anasoulis and Henry McDonald 28 Feb. 1974 38 p refs
(Contract F33615-72-C-2042; AF Proj. 3066)
(AD-775060; AFAPL-TR-73-98-Pt-2) Avail: NTIS CSCL 21/2

Measurements were conducted in a full annular premixed combustor to provide profiles of UHC, CO, CO2, O2, N2, H2, NO, NOx and temperature at various axial locations. The work was performed to further develop an existing computational procedure for predicting the performance and exhaust emission characteristics of can-annular or annular gas turbine combustors. The results, however, were also found to be useful in showing areas within the combustor where emissions, particularly NOx, are formed. (Modified author abstract) GRA

N74-23477# United Aircraft Corp., East Hartford, Conn. Research Labs.

DEVELOPMENT OF A COMBUSTOR FLOW ANALYSIS. PART 3: USER'S MANUAL FOR THE FIELD RELAXATION ELLIPTIC PROCEDURE Final Report

R. F. Anasoulis 18 Feb. 1974 85 p refs
(Contract F33615-72-C-2042; AF Proj. 3066)
(AD-775386; UARL-M911449-16-Pt-3; AFAPL-TR-73-98-Pt-3) Avail: NTIS CSCL 21/2

A finite-difference procedure for computing the flow within two-dimensional or axisymmetric combustion chambers is described. Different geometries and boundary conditions can be treated as well as alternate hydrocarbon fuels and oxidizers. Refinements to the chemistry, turbulence, or droplet flow modeling is easily implemented within the framework of the procedure. Noncombusting flow problems can also be treated by simple changes to the input data. The numerical code has been programmed in FORTRAN V and is designated F865. (Modified author abstract) GRA

N74-23515 European Space Research Organization, Paris (France).

EXPERIMENTAL STUDY OF THE CONDENSED PHASE IN THE COMBUSTION PRODUCTS OF METALLIZED SOLID PROPELLANTS

Paul Kuentzmann (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 33-61 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 71-80 (For availability see N74-23512 14-34)

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-23478 British Broadcasting Corp., Kingswood (England). Research Dept.

AN AUTOMATIC TARIF FOR NEWS FILM

D. T Wright Apr. 1974 19 p refs

(BBC-RD-1974/15) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Equipment is described which will make automatic frame-by-frame corrections of lift, color balance and gain errors in the red, green and blue color separation signals of a color television system. The principles of correction are: set the blackest part of each color-separation signal to a common preset reference level, make the mean levels of the three separation signals equal, and hold the maximum luminance value of the output signals at a fixed magnitude. Although these corrections may not produce results which are as good as can be obtained by a trained operator, considerable advantage is gained by the very rapid change of correction when a new shot occurs. Field trails have shown that the automatic unit, followed by a conventional manual Tarif unit, can improve operational performance. Author

N74-23479*# Southeastern State Coll., Durant, Okla. Technology Use Studies Center.

[SEARCH AND DISSEMINATION IN DATA PROCESSING] Quarterly Status Report, 1 Oct. - 31 Dec. 1973

C. Henry Gold, A. M. Moore, Bill Dodd, and Velma Dittmar Jan. 1974 55 p refs

(Contract NASw-2512)

(NASA-CR-138378; QSR-34) Avail: NTIS HC $5.75 CSCL 05B

Manual retrieval methods were used to complete 54 searches of interest for the General Aviation Newsletter. Subjects of search ranged from television transmission to machine tooling, Apollo moon landings, electronic equipment, and aerodynamics studies. G.G.

N74-23480*# Louisiana State Univ., New Orleans. Div. of Business and Economic Research.

APPLICATIONS OF SATURN/APOLLO AUTOMATED DATA SYSTEM CAPABILITIES TO PROBLEMS AND ENVIRONMENTAL IMPACTS OF URBAN TRANSPORTATION Final Report, 6 Oct. - 30 Nov. 1973

Gordon A. Saussy 4 Feb. 1974 7 p

(Contract NAS8-28955)

(NASA-CR-120216) Avail: NTIS HC $4.00 CSCL 13F

The work plan to achieve the objectives of this project is presented. Tasks discussed include ground truth, remotely sensed data, and the correlation of ground truth and the remotely sensed data. F.O.S.

N74-23481*# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.

COMPARATIVE EVALUATION OF SOLAR, FISSION, FUSION, AND FOSSIL ENERGY RESOURCES. PART 2: POWER FROM NUCLEAR FISSION Final Report

J. D. Clement [1973] 82 p refs

(Grant NGR-11-002-166)

(NASA-CR-138397; E-26-606-Pt-2) Avail: NTIS HC $7.25 CSCL 21D

Different types of nuclear fission reactors and fissionable materials are compared. Special emphasis is placed upon the environmental impact of such reactors. Graphs and charts comparing reactor facilities in the U. S. are presented. S.K.W.

N74-23482*# Clingman (W. H.) and Co., Dallas, Tex.

THE NAME-LOCATOR GUIDE: A NEW RESOURCE FOR TECHNOLOGY TRANSFER Final Report

William H. Clingman 1 Apr. 1974 33 p refs

(Contract NASw-2533)

(NASA-CR-138382) Avail: NTIS HC $4.75 CSCL 05B

A new transfer mechanism to facilitate technology transfer between aerospace technology and nonaerospace industries, was proposed with the following sequence of steps. First, the key technical problems in a given industry would be analyzed. The analysis will define the characteristics which relevant technology will have. Second, a limited list of subject terms will be developed using words familiar to those working in the industry. It is these which will be applied in subsequent steps to the NASA technology and used to locate technology relevant to a specific problem in the industry. Third, for each Required Technology Program, terms applicable to that program would be chosen from this list. Fourth, a name-locator guide would be provided to the Regional Dissemination Centers. This guide would be analogous to an index. The key words would be chosen from the special subject term list for the given industry. Author

N74-23483# National Research Council of Canada, Ottawa (Ontario).

QUARTERLY BULLETIN OF THE DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT, 1 JANUARY - 31 MARCH 1974

31 Mar. 1974 96 p refs

(DME/NAE-1974(1)) Avail: NTIS HC $8.00

Mechanical engineering projects on hydrodynamic code approximation, programming flying spot scanner/analyzer, and modifying Bell helicopters to serve as airborne simulators for STOL and V/STOL aircraft are sumarized. For individual titles, see N74-23484 through N74-23486.

N74-23484 National Aeronautical Establishment, Ottawa (Ontario). Structures and Materials Lab.

AN APPROXIMATE HYDRODYNAMIC CODE c12

P. Huculak *In* Natl. Res. Council of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Est., 1 Jan. - 31 Mar. 1974 31 Mar. 1974 p 1-10 refs (For availability see N74-23483 14-34)

A simplified hydrodynamic code was developed during the study of the transient interaction of a circular plate with a liquid-filled cavity. This mechanism is one of several that have been proposed to create pulsed, high speed, liquid jets. The numerical computational scheme (code) applied to unsteady, inviscid, axisymmetric flow. It is an extension of volume-displacement theory wherein complex moving boundaries are replaced by simple volume-conserving ones. Author

N74-23485 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.

PROGRAMMING THE NAE FLYING SPOT SCANNER/ANALYSER c14

H. N. C. Lyster *In* Natl. Res. Council of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Est., 1 Jan. - 31 Mar. 1974 31 Mar. 1974 p 11-23 (For availability see N74-23483 14-34)

The development of software for the flying spot scanner/analyser used primarily for aerial spray research is described. Author

N74-23486 National Aeronautical Establishment, Ottawa (Ontario). Flight Research Lab.

PROGRESS IN THE DEVELOPMENT OF A VERSATILE AIRBORNE SIMULATOR FOR V/STOL AIRCRAFT c11

W. S. Hindson, K. Lum, and W. E. B. Roderick *In* Natl. Res. Council of Can. Quart. Bull. of the Div. of Mechanical Eng. and the Natl. Aeron. Est., 1 Jan. - 31 Mar. 1974 31 Mar. 1974 p 25-51 refs (For availability see N74-23483 14-34)

Modifications made to a Bell 205A-1 helicopter so that it may perform as an in-flight simulator for a wide variety of STOL and V/STOL aircraft are described. The modifications result in a sophisticated computer-controlled flight vehicle capable of providing flexible support to V/STOL research and development activities in the interrelated fields of handling qualities, guidance and control, and cockpit display. Author

N74-23487# Committee on Government Operations (U. S. Senate).

STAFF STUDY OF THE OVERSIGHT AND EFFICIENCY OF EXECUTIVE AGENCIES WITH RESPECT TO THE PETROLEUM INDUSTRY, ESPECIALLY AS IT RELATES TO RECENT FUEL SHORTAGES

Washington GPO 8 Nov. 1973 115 p refs Prepared for the Permanent Subcomm. on Investigations, 93d Congr., 1st Sess., 8 Nov. 1973

(GPO-23-764) Avail: SOD $1.00

Policies of the Federal government are discussed as they relate to managing the oil import program, providing adequate supplies of crude oil for processing by refineries, overseeing operations and domestic refineries needed to meet demand, and maintaining a climate for the necessary expansion of domestic refinery capacity required to meet demand for gasoline and distillate fuel oil. A compilation of relevant facts accumulated from various sources is presented to serve as background for public hearings on oversight of the executive branch with respect to the petroleum industry, especially as it relates to recent fuel shortages. Author

N74-23488*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE: INDUSTRY OF RESEARCH AND FLIGHTS
R. Svoren Washington NASA May 1974 39 p Transl. into ENGLISH from Nauka Zhizn (Moscow), no. 1, Jan. 1974 p 16-26
(Contract NASw-2481)
(NASA-TT-F-15591) Avail: NTIS HC $5.00 CSCL 03B

Typical papers read at the 24th International Astronautics Congress held in Baku are presented. Interviews with the federation's president, and Soviet and American scientists are also presented. Author

N74-23489# Tokyo Univ. (Japan). Inst. of Space and Aeronautical Science.
ON THE THEORY OF HUMAN CROWD FLOW
L. F. Henderson Nov. 1973 13 p refs
(ISAS-500-Vol-38-No-11) Avail: NTIS HC $4.00

A theory is presented of the flow of people along a channel which may be of variable width, or have a partial blockage in it. The results are presented in kinetic form to facilitate comparison with observation. It is shown that a crowd flow may exhibit anomalous gas dynamic behaviour caused by a change in the sign of a well known derivative. This indicates that expansion shocks are possible in crowd flow. Author

N74-23490# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
[CONTINUED RESEARCH ON PLASMA AND GAS DYNAMICS, ENERGY, AERODYNAMICS, AND NOISE] Annual Progress Report
1973 165 p refs
Avail: NTIS HC $11.25

Research in a number of different areas is described. Topics included are: (1) dynamic and control experiments on communication technology satellites; (2) the interaction of gas species at a variety of initial velocities with solid target materials of carefully controlled surface conditions; (3) the development of ultrasensitive trace gas lasers; (4) the effects of imperfections on the stability of stiffened cylinders; (5) sonic boom simulation; (6) convective and refractive effects on jet noise patterns; (7) techniques of wind tunnel construction; (8) the performance and dynamic characteristics of air cushion vehicles; (9) the gasdynamics flow system under a neutron generator; (10) and the development of remote sensing devices based on laser induced fluorescence. S.K.W.

N74-23491# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany).
RESEARCH REPORTS FROM THE INSTITUTE FOR SERVICE RELIABILITY, ISSUE 6 [INSTITUTS VEROEFFENTLICHUNGEN HEFT 6]
Oct. 1973 218 p refs In GEORGIAN
Avail: NTIS HC $14.00

Activities at the laboratory centered on stress testing of welded joints, life estimates for fatigued structures, flight load analysis, acceleration loads on airplane tails, mission profiles for transport aircraft, environmental stress simulation for materials, vehicle wheel evaluation, statistical stress-strain-time analysis, fatigue life tests on construction components, and measurement methods for wheel spokes and rims. G.G.

N74-23492# Advisory Group for Aerospace Research and Development, Paris (France).
DIRECTOR'S ANNUAL REPORT, 1970, TO THE NATO MILITARY COMMITTEE
Apr. 1971 80 p
Avail: NTIS HC $7.00

A summary of AGARD's 1970 technical program is presented. Meetings, publications, personnel, and budgeting for this reporting period are discussed. Author

N74-23493# Advisory Group for Aerospace Research and Development, Paris (France).
THE AGARD CHARTER
1 May 1971 17 p In ENGLISH and FRENCH
Avail: NTIS HC $4.00

The charter, as authorized by the North Atlantic Military Committee document dated 5 April 1971, is presented in the original English version and in its French Translation. D.L.G.

N74-23494# Advisory Group for Aerospace Research and Development, Paris (France).
THE 1971 AGARD ANNUAL MEETING
Dec. 1971 78 p Meeting held at Nord-Torpa, Norway, 8 Sep. 1971
Avail: NTIS HC $7.00

The conference held in Nord-Torpa, Norway, 8 September 1971 is reported. The theme of the First Plenary Session was Norwegian Industrial and Defense Research Development, and the theme of the second session was Status and Trends in International Aerospace Cooperation. The presentation of each speaker is included. Author

N74-23495# Advisory Group for Aerospace Research and Development, Paris (France).
INTERNATIONAL CONFERENCE MANAGEMENT
George Zinnemann Jan. 1972 18 p Revised
Avail: NTIS HC $4.00

Some guidelines are presented for individuals involved in managing and participating in international conferences. The material is divided into four sections, each of particular significance to the project officer, the host organization, the meeting chairman, and the speakers, respectively. D.L.G.

N74-23496# Advisory Group for Aerospace Research and Development, Paris (France).
DIRECTOR'S ANNUAL REPORT TO THE NORTH ATLANTIC MILITARY COMMITTEE, 1971
Mar. 1972 82 p
Avail: NTIS HC $7.25

The report has been prepared in the context of the total AGARD 1971 Technical Program which is carried out by the AGARD Panels, the Consultant and Exchange Program, and the Military Committee Studies Program. The achievements are reported in terms of: (1) the meeting which were held to bring together the leading personalities of the NATO nations in a particular field of science and technology for the common benefit of the NATO community; (2) the AGARD Series publication which were distributed and/or initiated as a result of these meetings for the purpose of assisting member nations in the effective use of their research and development capabilities; (3) the personnel that planned for and participated in the total program, and (4) the budget that supported this stimulus to the advances in the aerospace sciences relevant to strengthening the common defense posture. The Appendix contains the detailed program of the individual activities. Author

N74-23497# Advisory Group for Aerospace Research and Development, Paris (France).
AGARD HANDBOOK (INCLUDING AGARD BY-LAWS)
Sep. 1972 31 p Revised
Avail: NTIS HC $4.75

A handbook which presents an overview of the AGARD organizational structure is presented. Topics include historical background, military studies program, panels and publications. The bylaws of AGARD are presented for reference purposes. S.K.W.

N74-23498# Advisory Group for Aerospace Research and Development, Paris (France).
HIGHLIGHTS: AGARD'S TWENTIETH ANNIVERSARY, 1952 - 1972
1972 29 p
Avail: NTIS HC $4.50

The first issue of AGARD's Highlights is presented. Changes and developments which have taken place since the establishment of AGARD in 1952 are detailed. Biographies are presented of the recipients of the first Von Karman Medals. S.K.W.

N74-23499# Advisory Group for Aerospace Research and Development, Paris (France).
DIRECTOR'S ANNUAL REPORT TO THE NORTH ATLANTIC

MILITARY COMMITTEE, 1972
1972 60 p
Avail: NTIS HC $6.00

Abstracts for AGARD series publications for 1972 are presented. Proceedings of panel meetings in the following subject areas are detailed: avionics, electromagnetic wave propagation, flight mechanics, fluid dynamics, guidance and control, propulsion and energetics, and structure and materials. A list of AGARD consultants and their subject specialties is also presented. S.K.W.

N74-23500# Advisory Group for Aerospace Research and Development, Paris (France).
HIGHLIGHTS, SPRING 1973
1973 32 p
Avail: NTIS HC $4.75

Short articles on the progress and activities of AGARD panels are presented. Panels are included in the areas of avionics, electromagnetic wave propagation, flight mechanics, and structures and materials. A summary of the work completed on the new AGARD multilingual aeronautical dictionary is included, along with a description of the plans for the publication of the collected works of Theodore Von Karman. K.M.M.

N74-23501# Advisory Group for Aerospace Research and Development, Paris (France).
INSTRUCTIONS TO AUTHORS OF AGARD MANUSCRIPTS: TO BE SET BY THE PRINTERS; INSTRUCTIONS TO AUTHORS OF AGARD MANUSCRIPTS: TO BE PREPARED CAMERA-READY
Oct. 1973 8 p Revised
Avail: NTIS HC $4.00

Instructions are given for those who are unable to use AGARD special layout paper for the preparation of manuscripts for AGARD publication. Also presented are the instructions for those who are preparing manuscripts for publication using the direct reproduction system. K.M.M.

N74-23502# Committee on Science and Astronautics (U. S. House).
NASA AUTHORIZATION, 1975, PART 3
Washington GPO 1974 698 p Hearings on H.R. 12689 (superseded by H.R. 13998) before Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., no. 25, 26-28 Feb. and 5-7, 12-14 and 19 Mar. 1974
(GPO-31-032) Avail: Subcomm. on Space Science and Applications

The hearings concerning the NASA program of applications are reported. Earth Resources Technology Satellites, Skylab, Nimbus, Tiros, and SEASAT are discussed along with pollution monitoring, earth resources surveys, crystal growth, comet Kohoutek, Pioneer Venus programs, and astronomical discoveries. For Part 2, see N74-21606. F.O.S.

N74-23503*# Massachusetts Inst. of Tech., Cambridge. Flight Transportation Lab.
AIR SERVICE TO SMALL COMMUNITIES, DIRECTIONS FOR THE FUTURE Final Report
Joseph F. Vittek, Jr., ed. Feb. 1974 84 p refs Sponsored by DOT
(Contract NASw-2524)
(NASA-CR-138377; FTL-R73-5) Avail: NTIS HC $7.25 CSCL 01E

The seminar on the problems of providing air service to low and medium density points is reported. National transport policies and programs are discussed along with the technology aspects. Recommendations for ATC, CAB, and FAA are included. F.O.S.

N74-23504# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
BACKGROUND INFORMATION FOR NEW SOURCE PERFORMANCE STANDARDS: ASPHALT CONCRETE PLANTS, PETROLEUM REFINERIES, STORAGE VESSELS, SECONDARY LEAD SMELTERS AND REFINERIES, BRASS OR BRONZE INGOT PRODUCTION PLANTS, IRON AND STEEL PLANTS, SEWAGE TREATMENT PLANTS. VOLUME 3: PROMULGATED STANDARDS
Feb. 1974 160 p refs 3 Vol.
(EPA-450/2-74-003-Vol-3; APTD-1352c) Avail: NTIS HC $11.00

Standards of performance are presented for asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. The promulgated standards and the rationale for any changes made are given, with particular attention to the problems of opacity and dilution air. Major comments received during the period for public comment are discussed and summarized along with Agency responses. Also contained are a list of commentators, new data for asphalt concrete plants, and revised economic analyses for asphalt concrete plants and petroleum refineries. Author

N74-23505# Environmental Research Inst. of Michigan, Ann Arbor.
SCIENCE AND TECHNOLOGY IN THE PUBLIC INTEREST
[1973] 25 p refs
Avail: NTIS HC $4.25

The purposes and background of the Environmental Research Institute of Michigan (ERIM) are given. The major objective of ERIM is to serve among gevernment agencies, universities, and industries as a catalytic agent for the application of advanced technology and associated scientific methodology to society's problems. Research facilities and activities are described along with multispectral (infrared) imaging and radar imaging technology. Information is also included on the measurement and analysis of signatures, technology transfer, and the application of remote sensing information systems to public planning and policy formation. K.M.M.

N74-23506# Committee on Science and Astronautics (U. S. House).
AUTHORIZING APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Teague Washington GPO 10 Apr. 1974 178 p Rept. to accompany H.R. 13998 presented by the Comm. on Sci. and Astronaut. at the 93d Congr., 2d Sess., 10 Apr. 1974
(H-Rept-93-983) Avail: US Capitol, House Document Room

Congressional authorization of appropriation to NASA for fiscal year 1975 are reported. Programs funded include research and development, construction of facilities, and research and program management. Individual programs within each of these three areas are summarized. S.K.W.

N74-23507# Committee on Science and Astronautics (U. S. House).
NASA AUTHORIZATION, 1975, PART 1
Washington GPO 1974 308 p Hearings on H.R. 12689 (superseded by H.R. 13998) before Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 25, 21 Mar. 1974 4 Vol.
(GPO-31-372) Avail: Comm. on Sci. and Astronaut.

Hearings on NASA appropriations for fiscal year 1975 are presented with an economic analysis of budget procedures. Research programs and management policies are outlined. Topics discussed include technology utilization, EEO programs, facility design, and satellite solar power systems. Procurement analysis for 1973 is also included. S.K.W.

N74-23508# Committee on Science and Astronautics (U. S. House).
NASA AUTHORIZATION, 1975, PART 4
Washington GPO 1974 730 p Hearings on H.R. 12689 (Superseded by H.R. 13998) before Comm. on Sci. and Astronaut., 93d Congr. 2d Sess., No. 25, 5-7, 12-14 and 20 Mar. 1974 4 Vol.
(GPO-31-022) Avail: Subcomm. on Aeron. and Space Technol.

For abstract, see N74-23507.

N74-23509*# Techtran Corp., Glen Burnie, Md.
THE CREATIVE LIFE OF S. V. IL'YUSHIN
G. V. Novozhilov Washington NASA May 1974 11 p Transl. into ENGLISH from Grazhdanskaya Aviatsiya (Moscow), no. 3, Mar. 1973 p 14-15
(Contract NASw-2485)
(NASA-TT-F-15622) Avail: NTIS HC $4.00 CSCL 05D

The professional carreer of aircraft designer S.V. Il'yushin is outlined. A brief history is given of the design office headed by Il'yushin and a brief description is given of some of the planes developed by this office for military and civilian purposes.
Author

N74-23510# North Atlantic Treaty Organization, Brussels (Belgium). Scientific Affairs Div.
TECHNOLOGY OF EFFICIENT ENERGY UTILIZATION
Eugene G. Kovach, ed. Oct. 1973 77 p Conf. held at Les Arcs, France, 8-12 Oct. 1973
Avail: NTIS HC $7.00

The proceedings of a conference on the efficient utilization of energy are presented. The contributions which science and technology could make to maintaining current processes at lower energy cost were investigated. Attention was centered on the end uses of energy, without consideration of its original source, its transmission, or even its form. The roles played by major social, political, or economic decisions were considered. The contributions to be expected from research and development activities toward efficient energy utilization were emphasized.
Author

N74-23511# Committee on Interior and Insular Affairs (U. S. Senate).
PRESIDENTIAL ENERGY STATEMENTS
Washington GPO 1973 112 p refs Presented to Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 1973 (GPO-24-936) Avail: SOD HC $1.05

Presidential energy statements relating to national energy policy are presented. Topics include energy requirements and the resources available to meet them. Research and development relating to energy production is discussed.
S.K.W.

N74-23512# European Space Research Organization, Paris (France).
AEROSPACE RESEARCH, BI-MONTHLY BULLETIN NO. 1973-2
Jan. 1974 175 p refs Transl. into ENGLISH of La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, ONERA, 1973 (ESRO-TT-6) Avail: NTIS HC $11.75; ONERA, Paris 20 F

Two calculations of the geometry of wing vortex sheets are discussed. A theoretical analysis of the stability conditions for rotating stall in an isolated rotor of an axial compressor is presented. The formation processes and the evolution of metallic oxide particles in the combustion products of a metallized propellant are reviewed. An asymptotic expansion method was applied to EM wave reflection from random surfaces. A method to determine the model characteristics of a structure from a vibration test is described. The finite element method was applied to multilayer and sandwich shells. For individual titles, see N74-23513 through N74-23522.

N74-23513 European Space Research Organization, Paris (France).
CALCULATION OF FLOWS AROUND WINGS WITHOUT THICKNESS WITH EVOLUTIVE VORTEX SHEETS c01
Colmar Rehbauch (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 1-15 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 53-61 (For availability see N74-23512 14-34)

Two calculations of the geometry of wing vortex sheets were carried out. Correct evaluation of the aerodynamic characteristics of some wings considered are a rectangular wing of very small aspect ration (AR = 1), and a sweptback wing of moderate aspect ration (AR = 3.78). They are both of zero thickness in incompressible flow, and the vortex sheets issue from the trailing edge and wing tips.
ESRO

N74-23514 European Space Research Organization, Paris (France).
CONDITIONS OF ROTATING STALL SUPPRESSION IN AXIAL COMPRESSORS c28
Yves LeBot (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 16-32 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 63-69 (For availability see N74-23512 14-34)

A theoretical analysis of the stability conditions for rotating stall in an isolated rotor of an axial compressor is presented. It is shown that this regime can be avoided when the ration between the flow axial velocity and the hub drive velocity at midheight is near to unity at the design point, the exact value of this ratio depending on the blade geometry. This conclusion is directly applicable to bypass turbojet fans and gives an indication of the evolution to be sought for multistage axial compressors. Moreover, reduction in engine noise is possible.
ESRO

N74-23515 European Space Research Organization, Paris (France).
EXPERIMENTAL STUDY OF THE CONDENSED PHASE IN THE COMBUSTION PRODUCTS OF METALLIZED SOLID PROPELLANTS c33
Paul Kuentzmann (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 33-61 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 71-80 (For availability see N74-23512 14-34)

Various techniques for experimentally determining granulometry are presented. An attempt is made at presenting particle characteristics and limits. Experimental results show a great dispersion of the engine functioning parameters on granulometry.
ESRO

N74-23516 European Space Research Organization, Paris (France).
ASYMPTOTIC EXPANSION METHOD FOR DETERMINING THE FIELD REFLECTED BY A RANDOM SURFACE c07
George Elias (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 62-96 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 81-98 (For availability see N74-23512 14-34)

The problem of the reflection of electromagnetic waves by a perfectly conducting, weak, and randomly uneven surface, fluctuating around a nonplanar surface, is approached by an asymptotic expansion method. This method is based on a representation of fields in normal modes. This expansion, carried out in two different forms, generalizes the small perturbation method. This method is applied to cylindrical geometry, for which formal and numerical results are presented.
Author (ESRO)

N74-23517 European Space Research Organization, Paris (France).
DETERMINATION OF A STRUCTURE'S ELGEN MODES BY A VIBRATION TEST WITH NON-SELECTIVE EXCITATION c31
Rolland Dat (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 97-118 ref Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 99-108 (For availability see N74-23512 14-34)

The factorization into partial fractions of transfer functions of a linear, discrete, and slightly dissipative system is expressed as a function of the modal characteristics of the associated conservative system and of the coefficients of the generalized matrix of viscous terms. These partial fractions can be obtained independently from the response to a sine excitation thanks to a special smoothing method.
Author (ESRO)

N74-23518 European Space Research Organization, Paris (France).
MATRIX ANALYSIS OF MULTILAYER AND SANDWICH SHELLS BY THE FINITE ELEMENT METHOD c32
Daniel Engrand (ONERA, Paris) et al *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 119-141 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 109-118 (For availability see N74-23512 14-34)

Multilayer shells and plates need special treatment in structural analysis because of the importance of transverse shear effects, particularly when there is significant bending. For multilayer shells of revolution, it is shown that it is possible to take into account this effect with a finite element method using a second order shell theory. Each layer is considered separately, using the same

type of element, and is assembled by a general method ensuring the exact continuity of the displacements at the interfaces. By this method, one may introduce some additional hypothesis for one or several layers (symmetry, local Kirchhoff hypotheses...) and thus reduce the number of degrees of freedom when it is possible. Some numerical examples emphasize, in particular, the influence of the rotations of the normals in different layers.
Author (ESRO)

N74-23519 European Space Research Organization, Paris (France).
OPTIMIZATION OF A VIBRATION GENERATOR IN CONDITIONS OF EXTERNAL EXCITATION **c32**
Jean Francois Boisseau (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 142-145 ref Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 119-120 (For availability see N74-23512 14-34)

An arrangement is proposed, which generalizes the results of the model of the Atwood machine in vibration conditions. Additional stiffness and damping is included for reducing the relative displacement between the mass and the structure in a given ratio whatever the value of the disturbance. ESRO

N74-23520 European Space Research Organization, Paris (France).
APPARATUS FOR THE QUALIFICATION OF VERY LOW FREQUENCY VIBRATION EXCITERS **c32**
Jean Francois Boisseau (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 146-155 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 120-122 (For availability see N74-23512 14-34)

Exciters are not only used in ground tests, during which the exciter is active and the structure passive, but also an aircraft in flight. In this case, the structure may be excited independently of the exciter, e.g. by atmospheric turbulence. The test device is a vibration generator which replaces the flight structure excited by turbulence. ESRO

N74-23521 European Space Research Organization, Paris (France).
HOT FATIGUE RESISTANCE IN FLUCTUATING AXIAL TENSION OF PER 7 AND IN 100 SUPERALLOYS **c17**
Georges Vidal (ONERA, Paris) et al *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 156-163 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 123-126 (For availability see N74-23512 14-34)

The axial fatigue strength of two refractory superalloys, PER 7 and IN 100, currently used in the manufacture of jet engine rotor blades, was determined at temperatures of 700, 800, and 900 C. The PER 7 material, similar to UDIMET 700, was used in the as-forged condition, and the IN 100 alloy was cast in the form of truncated cone carrots. Between 700 and 800 C, temperature has no influence on the fluctuating axial tension fatigue strength of these alloys. At 700 and 800 C, the PER 7 alloy is much superior to IN 100. At 900 C, the fatigue strength at the two alloys is much the same. ESRO

N74-23522 European Space Research Organization, Paris (France).
RELATIONSHIP BETWEEN THE GRAIN SIZE AND FATIGUE-STRIATED FACET DIMENSIONS IN AN ALUMINUM ALLOY **c17**
Georges Vidal (ONERA, Paris) *In its* Aerospace Res., Bi-monthly Bull. No. 1973-2 (ESRO-TT-6) Jan. 1974 p 164-170 refs Transl. into ENGLISH from La Rech. Aerospatiale, Bull. Bimestriel No. 1973-2, 1973, p 127-129 (For availability see N74-23512 14-34)

Results from microfractographic examination of fatigue failures in the aluminum 5% magnesium alloy AG 5 are reported for different grain sizes. Fatigue failures in this alloy have clearly visible fatigue striations, which are localized in quasi-flat areas or facets if the fatigue tests are effected in air or any humid atmosphere. ESRO

N74-23523# Barton-Aschman Associates, Inc., Chicago, Ill.
AIRPORT TRAVEL SURVEY MANUAL Final Report
Jul. 1973 105 p refs
(Contract DOT-FH-11-7889)
(PB-226121/2) Avail: NTIS HC $7.25 CSCL 13B

The manual contains guidelines for the collection of data describing ground travel patterns and trip-maker characteristics to and from air carrier airports. The manual is written for professionals responsible for conducting airport travel surveys. The introductory material describes the nature of travel patterns at carrier airports and provides an overview of the eight major steps in the travel data collection process. The advantages and disadvantages of alternative survey strategies are presented along with five types of data collection techniques. Criteria are given for the selection of appropriate survey strategies and data collection techniques. Survey specifications are presented in terms of sample base, methods for sample selection, methods for control counts, formats for questionnaires, and approximate unit costs involved. GRA

N74-23524# National Academy of Sciences - National Research Council, Washington, D.C. Highway Research Board.
TRANSPORTATION SYSTEMS PLANNING AND RESOURCE ALLOCATION
1973 91 p refs
(PB-228607/8; HRB-Record-467; LC-73-21058; ISBN-0-309-02251-7) Avail: NTIS HC$2.40; Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, D. C. 20418 CSCL 13B

Contents: incorporating environmental impacts in the transportation system evaluation process; structuring an analysis of pedestrian travel; a review of the public hearing process as a means of obtaining citizen views and values; environmental mapping-an ecological methodology for highway impact analysis; a study of land development and traffic generation on controlled-access highways in North Carolina; resource allocation and the system planning process; balancing project costs and revenue target; measuring time losses a highway bottlenecks and empirical findings for the Chesapeake Bay Bridge; accident costs--some estimates for use in engineering-economy studies; and evaluating mutually exclusive investment alternatives-rate of return methodology reconciled with net present worth. GRA

N74-23525# AiResearch Mfg. Co., Torrance, Calif.
LIM GUIDANCE SYSTEM DYNAMICS: THEORETICAL STUDIES AND EXPERIMENTAL TESTS Interim Report, Feb. 1972 - Jan. 1973
C. C. Chi Sep. 1973 123 p
(Contract DOT-FR-7-35399)
(PB-226283/0; FRA-ORD/D-74-22; Rept-73-9065) Avail: NTIS HC $8.25 CSCL 13F

The linear induction motor research vehicle (LIMRV) is a test bed constructed to eveluate the LIM as a propulsion system. Satisfactory LIM guidance system performance is vital to the ongoing progress of this research program. The report describes preliminary theoretical studies of LIM guidance system dynamic behavior, and documents the experimental results obtained during the first phase of the LIMRV speed upgrading tests conducted at the DOT High-Speed Ground Test Center, Pueblo, Colorado. After the operational tests, additional analytical work was accomplished, leading to system modifications that provided better control of the LIM/reaction rail clearance (mechanical gap), statically, without adversely affecting dynamic behavior. Guidance system dynamics tests were later performed to confirm the theoretical work. GRA

N74-23526# Texas Univ., Austin. Lyndon B. Johnson School of Public Affairs.
PROCEEDINGS OF THE URBAN TECHNOLOGY SEMINAR Final Report
1973 144 p refs Seminar held at Austin, Tex., 30 Apr. - 3 May 1972
(Grant NSF GT-33702)
(PB-226064/4; LC-73-620193) Avail: NTIS HC $9.25 CSCL 13B

The document contains the formal presentations given during the Urban Technology Seminar held on the campus of the University of Texas at Austin, April 30 to May 3, 1972. The conference was planned and conducted by the Office of Conferences and Training of the Lyndon B. Johnson's School of Public Affairs as one of a series of conferences, seminars and training programs to serve the continuing education needs of government and to promote an exchange of views and ideas among participating government officials, academicians, and other participants from both the public and private sectors of American life. GRA

N74-23527# Transportation Systems Center, Cambridge, Mass.

SUMMARY OF NATIONAL TRANSPORTATION STATISTICS
Final Report

Gill V. Hicks and Sherri Y. Sheppard Nov. 1973 111 p
(PB-226747/4; DOT-TSC-OST-73-36) Avail: NTIS HC $4.25 CSCL 13F

The report is a compendium of selected national level transportation statistics. Included are cost inventory, and performance data describing the passenger and cargo operations of the following modes: air carrier, general aviation, automobile, bus, truck, local transit, rail, water, and oil pipline. Published annually in November, the report includes basic descriptors of U.S. Transportation, such as operating revenues and expenses, number of vehicles and employees, vehicle-miles and passenger miles, etc. As its name implies, the report is a summary of a larger data base, consisting of time-series collected from a variety of government and private statistical handbooks. In this edition, the selected data cover the period 1961 through 1971. GRA

N74-23528# Informatics, Inc., Rockville, Md.

SELECTED MATERIAL FROM SOVIET TECHNICAL LITERATURE, NOVEMBER 1973

Stuart G. Hibben 16 Jan. 1974 156 p refs
(Contract F44620-72-C-0053; ARPA Order 1622)
(AD-776086; AFOSR-74-0362TR) Avail: NTIS CSCL 05/2

The report includes abstracts and bibliographic lists on contractual subjects that were completed in November, 1973. The major topics are: Laser technology, particle beams, and material sciences. A section on items of miscellaneous interest is included as an optic topic. Laser coverage is generally limited to high power effects; all current laser material is routinely entered in the quarterly laser bibliographies. GRA

N74-23017 European Space Technology Center, Noordwijk (Netherlands). Space Science Dept.

EXPERIENCE OF CO-OPERATION IN THE ESRO SOUNDING-ROCKET PROGRAMME

A. Pedersen *In* ESRO European Sounding-Rocket and Related Res. at High Latitudes Nov. 1973 p 295-299 (For availability see N74-22980 14-13)

N74-23180 Joint Publications Research Service, Arlington, Va.

AT THE MAIN ADMINISTRATION OF THE HYDROMETEOROLOGICAL SERVICE

V. Zakharov *In its* Meteorol. and Hydrol., No. 2, 1974 (JPRS-61869) 30 Apr. 1974 p 158-159 refs Transl. into ENGLISH from Meteorol. i Gidrolog. (Moscow), no. 2 1974 p 118 (For availability see N74-23163 14-20)